

**ÉCOLE DOCTORALE SCIENCE DE LA SOCIÉTÉ TERRITOIRE, ÉCONOMIE,
DROIT**

LABORATOIRE d'Économie d'Orléans

THÈSE présentée par :
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Soutenue le : **18 décembre 2019**

Pour obtenir le grade de : **Docteur de l'université d'Orléans**

Discipline/ Spécialité : Économie Internationale

**The Impact of Egypt's Political Transition and
Economic Disruption on its Export
Performance: Three Essays**

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Je dédie cette thèse à mes parents et mon frère.

Remerciements

Je tiens à remercier M. Daniel MIRZA, mon directeur de thèse, qui a été une source constante d'inspiration, de connaissance, de patience et de sagesse, depuis les études de mon master et tout au long de ce parcours. J'ai commencé ma thèse quand j'étais dans une autre ville et que je faisais un travail différent. Depuis lors, beaucoup de choses ont changé, mais les encouragements et la disponibilité de M. Mirza n'ont pas changé, et je lui en suis très reconnaissant.

Je tiens à remercier les rapporteurs et les membres du jury, M. Marcelo OLARREAGA, M. Jose DE SOUSA, Mme. Julie LOCHARD, M. Habib ZITOUNA et M. Christophe RAULT, pour avoir accepté d'être rapporteurs et membres du jury. Merci de votre disponibilité et d'avoir pris le temps de participer à cette soutenance.

Ma profonde gratitude va à ma famille, à ma mère, à mon père et à mon frère, pour leurs encouragements constants, pour leur confiance en tous les stages de ce voyage et pour avoir pris le temps de m'assurer de la meilleure façon possible. À ma mère, merci d'avoir toujours choisi les mots justes pour me soutenir et d'être un modèle en matière de travail acharné, de loyauté et de persévérance. À mon père, merci de m'avoir poussé à atteindre mes objectifs et d'avoir pris le temps d'écouter toutes mes mises à jour tout au long de ce voyage. Pour le meilleur musicien et chercheur que je connaisse, cette thèse de doctorat est pour nous deux. À mon frère, mon petit frère, merci de me soutenir de la façon dont tu fais le mieux, de me faire croire que je peux voler haut avec mes rêves et que même le ciel, ce n'est pas la limite.

Au Caire, je voudrais remercier ma deuxième famille, Shorouk, Lydia, Marline, Martina et Merna. Chaque mot et acte d'encouragement que vous avez fourni a été d'une grande aide.

À Londres, je voudrais remercier trois familles, ma famille à la BERD, ma famille à Saint-Marc et les Londoniens Egyptiens. Chacun a apporté son soutien avec ses connaissances, son temps et ses prières.

Je tiens à remercier M. Chahir ZAKI qui, avec ses connaissances et son enthousiasme intellectuel, a été une inspiration pour moi-même et pour de nombreux jeunes chercheurs, et avec qui j'ai eu l'honneur de partager des expériences de recherche.

Enfin, mes remerciements vont à toute l'équipe du Laboratoire d'Economie D'Orléans pour leur disponibilité et leur soutien chaque fois que nécessaire.

I would like to thank M. Daniel MIRZA, my thesis supervisor, who has been a constant source of inspiration, knowledge, patience and wisdom, since my master's studies and throughout this journey. I started my thesis when I was in a different city and doing a different job. Since then, a lot has changed but the encouragement and availability of M. Mirza did not, and I am very grateful for that.

I would like to thank the reporters and the Jury members, M. Marcelo OLARREAGA, M. Jose DE SOUSA, Mme. Julie LOCHARD, M. Habib ZITOUNA, et M. Christophe RAULT, for accepting to be reporters and jury members. Thank you for your availability and for taking the time to participate in this defence.

My deep gratitude goes to my family, my mother, my father and my brother, for their constant encouragement, for believing in me throughout all the seasons of this journey and for taking the time to assure me in the best ways they could. To my mother, thank you for always choosing the right words to support me and for being a role model in hard work, loyalty and perseverance. To my father, thank you for pushing me to achieve my goals and for always taking the time to listen to all my updates throughout this journey. To the best musician and researcher I know, this doctorate thesis is for both of us. To my brother, my little brother, thank you for supporting me in the way you do best, making me believe I can fly high with my dreams and even the sky, is not the limit.

In Cairo, I would like to thank my second family, Shorouk, Lydia, Marline, Martina and Merna. Every word and act of encouragement you provided was of a great help.

In London, I would like to thank three families, my EBRD family, my St. Mark's family and the Londoner Egyptians. Everyone has been supportive with their knowledge, time and prayers.

I would like to thank M. Chahir ZAKI, who with his knowledge and intellectual enthusiasm, has been an inspiration to myself and many young researchers, and with whom it has been an honour to have shared research experiences.

Last but not least, my thanks go to all the team of the Laboratoire d'Economie D'Orléans for their availability and support whenever needed.

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Résumé

L'Égypte a été témoin de vagues d'événements qui ont affecté son instabilité politique et qui ont finalement entraîné des perturbations économiques. Fin 2010, les soulèvements ont commencé en Tunisie. Peu de temps après, particulièrement en janvier 2011, l'Égypte a pris la vague et des gens sont descendus dans la rue pour exprimer leur insatisfaction face à la situation économique et réclamer « Liberté, Dignité et justice sociale ! ». Ces événements ont entraîné des troubles politiques, suivis de perturbations économiques qui ont affecté différemment les classes sociales, les secteurs économiques et les régions géographiques. Dans une seconde vague, après plus de deux ans de perturbations et un climat d'incertitude politique et économique, une nouvelle vague de soulèvements a commencé à appeler à un changement de système, exprimant son mécontentement vis-à-vis des décisions gouvernementales, des services et de la qualité des infrastructures, notamment de l'alimentation électrique. Pendant cette période d'instabilité, des perturbations économiques ont eu lieu lorsque les investissements étrangers se sont éloignés de l'Égypte, les entreprises ont été affectées différemment et l'approvisionnement en électricité des ménages ainsi que des entreprises a été interrompu. En utilisant des données au niveau des entreprises, la thèse étudie l'impact de la transition politique et des perturbations économiques sur la performance des exportations de l'Égypte à travers trois angles :

- L'impact du type de propriété et de la conversion de propriété sur les résultats à l'exportation des entreprises,
- L'impact des coupures d'électricité sur les résultats à l'exportation des entreprises,
- L'effet des événements par type sur les résultats à l'exportation des entreprises.

Chapitre 1 : Structure de la propriété et performance à l'export des firmes égyptiennes

Le chapitre 1 vise à lier l'effet de la structure de propriété en Égypte sur la performance des firmes en termes d'export. La structure de propriété des firmes fait l'objet de nombreuses publications depuis de nombreuses années, avec des preuves empiriques reflétant différents résultats et implications. Stiglitz (1988) souligne l'inefficacité des entreprises du secteur public pour deux raisons spécifiques : les incitations organisationnelles, où la compétitivité et la faillite sont souvent négligées par les dirigeants des entreprises d'État, et l'absence d'une définition claire de leurs biens au grand nombre de propriétaires ou de ressources. Li et Xia (2008) expliquent qu'en absence d'une meilleure structure d'incitation et d'un système de suivi amélioré défini par les propriétaires, les gestionnaires utilisent cet avantage pour obtenir des

gains personnels au détriment de l'intérêt des investisseurs. Sheshinski et al (2003) expliquent que, selon la théorie de la "construction d'empire", les gestionnaires publics intègrent leur objectif de carrière politique dans la fonction de SOE.

Le sujet égyptien revêt un intérêt particulier en raison du programme de privatisation national lancé par le gouvernement dans les années 90 et se poursuivant jusqu'à la fin des années 2000. Le gouvernement égyptien a désigné 314 entreprises d'État en tant que candidats potentiels à la privatisation, offrant ainsi des opportunités d'investissement et de profit attractifs. En 1991, les 314 entreprises publiques égyptiennes ont été regroupées dans 27 sociétés de portefeuille (réduites à 14 en 2001), responsables de toutes les filiales dans divers secteurs. Les entreprises privatisées étaient diversifiées dans un certain nombre de secteurs, notamment l'agriculture, l'immobilier et la construction, le secteur de l'alimentation et des boissons, la minoterie et le commerce de détail, ciment, produits chimiques et engrais, ingénierie, produits pharmaceutiques et tourisme.

Avance rapide jusqu'en 2010, les salaires étaient en baisse, l'emploi a diminué et les manifestations ont commencé. La privatisation était déjà bloquée et presque complètement arrêtée. Cependant, le cabinet a décidé d'officialiser la décision en l'annonçant publiquement afin de tenter de se réconcilier avec les troubles publics. Malgré la décision de ce gouvernement et la perspective d'élections l'année suivante, la révolution a débuté le 25 janvier 2011 sous le slogan « Liberté, dignité et justice sociale ! ». À la suite de cette privatisation, notre recherche s'intéresse à l'impact de la structure de la propriété, et plus particulièrement de la conversion d'une entreprise, sur ses performances en termes de productivité totale des facteurs et d'exportation vers les marchés étrangers.

Ce chapitre est le premier à se pencher sur les exportations des entreprises égyptiennes autour des événements et des instabilités politiques, en les reliant à la structure de propriété et en passant notamment de la propriété publique à la propriété privée, conformément au programme du gouvernement.

Les résultats de ce chapitre sont les suivants : premièrement, nous constatons un effet significatif positif de la propriété étrangère sur la performance des entreprises en termes d'exportations et de probabilité d'exporter. Cela peut être lié à l'efficacité des opérations apportées par la propriété étrangère, à l'expansion du réseau d'une entreprise à l'international et à la simplification du transport et de la logistique des exportations.

Deuxièmement, nous constatons que le transfert de propriété du privé au public a un effet négatif important sur les exportations d'une entreprise ainsi que sur la probabilité d'exporter. En outre, les résultats montrent que le passage de la propriété privée à la propriété étrangère a un effet significatif positif sur la probabilité d'exportation et sur les résultats à l'exportation. Enfin, lorsque nous testons l'effet des variables de propriété sur la productivité totale des facteurs des entreprises, nous constatons que seule la conversion de la propriété privée en propriété publique a un effet négatif significatif sur la PTF.

Chapitre 2 : Performances des firmes manufacturières en cas de panne de courant et les exports : données de firmes égyptiennes

Le secteur manufacturier a toujours joué un rôle clé dans la croissance de l'économie égyptienne, contribuant à la valeur ajoutée, créant des emplois et exportant vers les marchés internationaux. Entre 2000 et 2016, la valeur ajoutée du secteur a représenté en moyenne 17% du PIB. Après les événements de 2011 et l'instabilité politique résultant de la situation, la part du secteur dans le PIB a diminué, plongeant à un niveau bas de 15,9 en 2012 mais se redressant progressivement. En outre, le secteur manufacturier génère plus de 25% des emplois sur le marché égyptien et contribue largement aux exportations.

Toutefois, les exportations égyptiennes, y compris les exportations de produits manufacturés, ont été confrontées à différents obstacles au cours de la décennie écoulée, à commencer par la crise économique mondiale, en raison des turbulences politiques de 2011 à 2013 qui ont perturbé l'expansion de la capacité de production d'électricité de l'Égypte, entraînant un retard par rapport à la demande toujours croissante. Le manque d'électricité a été aggravé par la baisse de la production de gaz naturel et par une crise des devises étrangères qui a limité la capacité du gouvernement de payer le carburant qu'il soit importé ou produit localement par des sociétés pétrolières internationales.

La pénurie d'électricité à laquelle l'Égypte a été confrontée à la suite des turbulences politiques entre 2011 et 2013 a incité ce chapitre à examiner différentes variables représentant les services d'infrastructure électrique au niveau de l'entreprise et à tenter de les lier à la productivité des entreprises, aux résultats à l'exportation et à la probabilité d'entrer sur les marchés étrangers. Ce chapitre a pour objectif d'examiner l'effet de la qualité et de l'accessibilité des infrastructures électriques sur les marges d'exportation des entreprises manufacturières en Égypte, ainsi que sur leur productivité totale en facteurs.

Premièrement, le chapitre évalue l'effet de l'infrastructure électrique sur le volume des exportations. Dans un deuxième temps, le chapitre examine comment l'hétérogénéité des caractéristiques et de l'accessibilité énergétique se traduit par différentes performances à l'exportation représentées par la décision d'exporter. Enfin, nous explorons une voie d'explication de l'effet sur la performance des exportations par le biais de la productivité totale des facteurs.

Les résultats montrent que le nombre de pannes au cours d'un mois typique, ainsi que le nombre d'heures de pannes au cours d'un mois typique, ont un effet significatif négatif sur les résultats à l'exportation des entreprises égyptiennes. Cependant, nous constatons que ces effets n'existent pas lorsque nous les testons sur la productivité totale des facteurs des entreprises. Fait intéressant, nous constatons l'effet négatif des interruptions sur les résultats à l'exportation, mais pas via le lien de la productivité totale des facteurs. Davantage de recherches sont nécessaires pour comprendre comment les pannes de courant peuvent produire de tels résultats sur les performances à l'exportation, indépendamment de la PTF.

Chapitre 3 : L'impact de l'instabilité politique sur les exportations égyptiennes : Données au niveau de firme

Les chiffres du commerce extérieur égyptien se sont brusquement détériorés après la crise de 2008, puis ont continué à baisser depuis le Printemps Arabe et les événements terroristes qui ont suivi 2011. Les exportations et les importations en termes de PIB ont été réduites de 15 à 25% depuis 2011. Les événements et d'autres formes de violence, y compris des actes de terrorisme, pourraient être à l'origine de la perte de compétitivité de l'Égypte. D'après la base de données ACLED (Conflict Armed Conflict Location & Event Data), une base de données à notre disposition qui répertorie tous les événements violents par date et type (émeutes / terrorisme / autres violences), l'Égypte a connu environ 6 200 événements violents depuis 2011, dont environ 4 500 sont liés à des émeutes / manifestations.

Par conséquent, ce chapitre vise à étudier à quelle mesure les conflits et les tensions en Égypte expliquent ces pertes dramatiques de compétitivité. Plus particulièrement, l'objectif est d'ouvrir la boîte noire pour voir comment les entreprises ont réagi à la crise, en termes de volume et de valeur des exportations des entreprises d'une part et des prix facturés de l'autre.

Nos principales conclusions montrent que la marge intensive des exports est affectée négativement par différents événements. Cet effet est plus fort pour les petites entreprises, suivi par les moyennes pour les quantités et les valeurs des exportations, bien que plus marqué pour les quantités. De plus, les valeurs unitaires connaissent une augmentation, notamment pour les petits et moyens exportateurs. Les exportateurs égyptiens ont également tendance à dérouter leurs exportations des destinations où ils doivent faire face à une concurrence accrue en période d'instabilité politique.

Summary

Context

Egypt has witnessed waves of events which affected its political instability and eventually resulted in economic disruption. In late 2010, uprisings started in Tunisia. Not long after, specifically in January 2011, Egypt caught the wave and people took to the street expressing dissatisfaction with the economic situation and calling for “Freedom, Dignity, and Social justice!”. These events resulted in political unrest, followed by economic disruption which affected social classes, economic sectors and geographical regions, differently. In a second wave, after over two years of disruption and an environment of political and economic uncertainty, a new wave of uprisings began to call for a change of system, expressing dissatisfaction with government decisions, services and quality of infrastructure especially the power supply. During this period of instability, economic disruption took place where foreign investments shied away from Egypt, businesses were affected differently, and power supply to households as well as to companies was disrupted. Using firm level data, the thesis researches the impact of Egypt’s political transition and economic disruption on its export performance through three angles:

- The impact of ownership type and ownership conversion on firms’ export performance,
- The impact of electricity outages on firms’ export performance,
- The effect of events by type on firms’ export performance.

Chapter 1: Ownership Structure and Egyptian Firms' Export Performance

Chapter 1 aims at linking the effect of ownership structure in Egypt on firms' performance in terms of their export activity. Ownership structure of businesses has been a topic of focus of literature for many years with empirical evidence reflecting different results and implications. Stiglitz (1988) points out the inefficiency of public sector enterprises for two specific reasons: Organizational incentives, where competitiveness and bankruptcy are often neglected by the managers of state-owned enterprises (SOE), and the lack of a clear definition of their property due to the large number of owners or resources. Li and Xia (2008) explain that in the absence of a better incentive structure and an improved monitoring system set by the owners, managers use this advantage for personal gains at the expense of investor interest. Sheshinski et al (2003) explain that, according to the theory of "empire building", public managers integrate their political career goal in the function of SOE.

This topic is of particular interest to the Egyptian case because of the national privatization programme launched by the government in the 1990s and continuing until the late 2000s. The Egyptian government earmarked 314 SOEs as potential candidates for privatisation, offering attractive investment and profit opportunities. In 1991, Egypt's 314 SOEs were grouped under 27 holding companies (reduced to 14 by 2001) responsible for all the affiliates in various sectors. The number and value of the Egyptian privatised firms, classified by years and method of sale, is explained in Table 1. The privatised firms were diversified over a number of sectors, including agriculture, real estate and construction, food and beverages, milling, retail, cement, chemicals and fertilizers, engineering, pharmaceuticals, and tourism.

Fast forward to 2010, wages were down, employment shrank, and protests started. The privatisation was already stalling and almost completely stopped. However, the cabinet decided to officialise the decision by announcing it publicly in an attempt to reconcile with the public unrest. Despite this government's move and with the prospect of elections the following year, the revolution started on January 25th of 2011 with the slogan of "Freedom, dignity and social justice!". On the back of this privatisation, our research takes interest in how the ownership structure and most specifically the conversion of a firm ownership affected its performance in terms of total factor productivity and exports to foreign markets.

While the empirical research is scarce on the impact of ownership on firms' export performance, it is almost non-existent for Egypt. This chapter is the first to look at Egyptian firms' exports around the uprisings and political unrest, linking them to the ownership structure and shift especially from the public to private ownership, following the government's program. The results of this chapter are fourfold: First, we find a positive significant effect of foreign ownership on firms' performance in terms of exports and export probability. This can be linked to the efficiency of operations brought by foreign ownership, the expansion of a firm's network internationally and easing the transport and other logistics of exports.

Second, we find that the switch of ownership from private to public has a significant negative effect on the exports of a firm as well as to probability to export. Furthermore, the results show that a switch of ownership from private to foreign ownership has a positive significant effect on the probability to export and on export performance.

Lastly, when we test the effect of ownership variables on the total factor productivity of firms, we find that only the conversion from private to public ownership has a significant negative effect on the TFP.

Chapter 2: Power Outage and Manufacturing Firms' Export Performance: Evidence from Egyptian Firm-Level Data

The Manufacturing sector has always played a key role in driving the growth of the Egyptian economy contributing to the value added, creating jobs and exporting to international markets. Between 2000 and 2016, the value added of the sector has contributed on average to 17 per cent of the GDP. After the uprisings of 2011 and the political instability that resulted from the situation, the share of the sector to the GDP declined – diving to a low level of 15.9 in 2012 but gradually recovering. Moreover, the manufacturing sector fosters over 25 per cent of Jobs in the Egyptian market and contributes largely to exports.

However, Egyptian exports including manufacturing exports, faced different headwinds in the past decade starting with the global economic crisis, through the political turmoil between 2011 and 2013 that disrupted the expansion of Egypt's electricity generation capacity, causing it to lag behind the ever-rising demand. The power shortfall has been exacerbated by declining

natural gas production and a foreign currency crisis which has restricted the government's ability to pay for fuel, whether imported or produced locally by international oil companies.

The Central bank's decision in November 2016 to float the Egyptian pound, resulting in a severe devaluation of the Egyptian Pound, has contributed to the dollar crisis and the government's ability to subsidize imported power supply.

This power shortage that Egypt faced on the back of the political turmoil between 2011 and 2013 inspired this chapter to look at different variables that represent power infrastructure services at a firm level and attempt to link these variables to firms' productivity, export performance and the probability to enter foreign markets. This chapter aims to investigate the effect that power infrastructure quality and accessibility have on the extensive and intensive export margins of manufacturing firms in Egypt as well as their total factor productivity.

Power outages can negatively impact business activities through different routes: First, the uncertainty and unpredictability of the time of outages and the duration of each outage means a loss of efficiency of production due to interruption of operations, assets being used under their optimal capacity resulting in higher costs of production and ultimately, under-delivery of output level. Moreover, power outages represent an increased cost to the business in order to meet their output targets and deadlines. Firms require to replace machinery, which was affected by the outages, invest in electrical generators, or finally increasing the costs of manpower to compensate the loss of production incurred due to the power outages.

Using firm-level data from the World Bank's enterprise survey for the years 2008, 2013 and 2016, we attempt to link Egyptian firms' heterogeneity in productivity and characteristics related to the access to power infrastructure dysfunctionalities such as average power outages, losses in sales due to power outages and the possession of power generators. Doing so, we focus on two types of variables related to the provision of electricity: one type external, and the other internal to each firm. External variables represent electricity supply, power outages and the losses occurring due to these outages. The internal variable is related to firm's infrastructure and represented by owning a power generator.

First, the chapter estimates the effect of power infrastructure on the volume of exports. In a second step, the chapter evaluates how the heterogeneity in characteristics and power accessibility translates into different export performances represented by the decision to export.

Finally, we explore one route of explanation of the effect on export performance through total factor productivity.

Results show that the number of outages in a typical month as well as the number of hours of outages in a typical month, have a negative significant effect on the export performance of Egyptian firms. However, we find that these effects do not exist when we test them on the total factor productivity of firms. Interestingly, we find the negative effect of outages on export performance, but not via the nexus of total factor productivity. More research is needed to understand how power outages can be producing such result on export performance, independently from TFP.

Chapter 3: The Impact of Political Instability on Egypt's Exports: Evidence from Firm Level Data

Egyptian foreign trade figures have deteriorated abruptly after the 2008 crisis, and then continued to go down since the Arab Spring and terrorism events after 2011. Exports and imports with respect to GDP have been reduced by 15 to 25% since 2011. One of the reasons behind such a deterioration is riots and other forms of violence, including acts of terrorism that might be responsible of Egypt's loss of competitiveness. Following the Armed Conflict Location & Event Data (ACLED) dataset, a dataset at our disposal which lists all violent events by date, and type (riots/terrorism/other violence), Egypt experienced around 6,200 violent events since 2011, about 4500 of which are related to riots/protests.

Therefore, this chapter aims at studying the extent to which conflicts and tensions in Egypt are explaining these dramatic losses in competitiveness. More particularly, the objective is to open the black box to see how firms reacted to the events during the turmoil, in terms of the volumes and values of firm exports on one hand and prices charged, on the other hand.

Our main findings show that the intensive margin of trade is negatively affected by different events. This effect is more pronounced for small firms followed by medium ones for both the quantities and the values of exports, though stronger for quantities. Moreover, unit values experience an increase, notably for small and medium exporters. Egyptian exporters tend also

to reallocate their exports from destination where they face a fiercer competition during period of political instability.

Chapter 1: Ownership Structure and Egyptian Firms' Export Performance

1. Introduction

This chapter aims at linking the effect of ownership structure in Egypt on firms' performance in terms of their export activity.

Ownership structure of businesses has been a topic of focus of literature for many years with empirical evidence reflecting different results and implications. In their book "*The Modern Corporation and Private Property*" in 1932, Berle and Means explain the potential link of ownership with performance with a simple explanation. When ownership is widely dispersed, owners do not face strong incentives to engage in monitoring and managing the business since it requires high monitoring efforts and costs with no perspective of equivalent benefits. In this context, owners are more likely to depend on others for management. On the contrary, firms with a more concentrated ownership, private owners tend to be more responsible and alert to the business monitoring which is translated to better management and the business is more likely to perform better.

Furthermore, Stiglitz (1988) points out the inefficiency of public sector enterprises for two specific reasons: Organizational incentives, where competitiveness and bankruptcy are often neglected by the managers of state-owned enterprises (SOE), and the lack of a clear definition of their property due to the large number of owners or resources.

The explanation for the ineffectiveness of public property by theorists comes from 1965 by Alchian. He suggested that property rights are more attenuated in a public company than in a private enterprise. Li and Xia (2008) explain that in the absence of a better incentive structure and an improved monitoring system set by the owners, managers use this advantage for personal gains at the expense of investor interest. Sheshinski et al (2003) explain that, according to the theory of "empire building", public managers integrate their political career goal in the function of SOE.

This topic is of particular interest to the Egyptian case because of the national privatization programme launched by the government in the 1990s and continuing until the late 2000s. In 1991, the Egyptian government embarked upon a comprehensive economic reform and structural adjustment programme, the core of which was liberalisation and privatisation of

Egypt's economy. One crucial issue of privatization is its effect on the level of employment after firms move from public sector to the private sector. State-owned enterprises (SOEs), before divestiture, tend to be overstaffed for many social reasons; hence, extensive layoffs would have been expected. Between 1960 and 1990, SOEs handled 75% of Egypt's economic activity under the direction of various ministries (Adams, 2000). This appears to have produced poor management, inefficient bureaucracy, huge number of employees (more than 1.3 million public enterprise employees) with low rate of productivity per-employee and weak capitalisation. State presence in their capital led to negative effects on the efficiency and financial viability of these firms (MohiEldin, 1996).

Another objective of the Egyptian privatisation programme was to achieve wider share ownership, by selling large amounts of state enterprises to private owners (Hassan, 2001). The Egyptian government earmarked 314 SOEs as potential candidates for privatisation, offering attractive investment and profit opportunities. In 1991, Egypt's 314 SOEs were grouped under 27 holding companies (reduced to 14 by 2001) responsible for all the affiliates in various sectors. The number and value of the Egyptian privatised firms, classified by years and method of sale, is explained in Table 1. The privatised firms were diversified over a number of sectors, including agriculture, real estate and construction, food and beverages, milling, retail, cement, chemicals and fertilizers, engineering, pharmaceuticals, and tourism.

Fast forward to 2010, wages were down, employment shrank, and protests started. The privatisation was already stalling and almost completely stopped. However, the cabinet decided to officialise the decision by announcing it publicly in an attempt to reconcile with the public unrest. Despite this government's move and with the prospect of elections the following year, the revolution started on January 25th of 2011 with the slogan of "Freedom, dignity and social justice!". On the back of this privatisation, our research takes interest in how the ownership structure and most specifically the conversion of a firm ownership affected its performance in terms of total factor productivity and exports to foreign markets.

While the empirical research is scarce on the impact of ownership on firms' export performance, it is almost non-existent for Egypt. This chapter is the first to look at Egyptian firms' exports around the uprisings and political unrest, linking them to the ownership structure and shift especially from the public to private ownership, following the government's program.

2. Literature Review

This chapter aims to link two strands of the literature, the impact of ownership structure on firms' performance and firms' capability to export according to its level of productivity. Therefore, the theoretical relationship between the type of ownership of a firm and its export performance can be explained through the nexus of its total factor productivity, where the type of ownership is known in the literature to affect the level of productivity in a company (see below). Consequently, it is expected to play a key role in determining whether a company can export or not, on one hand, and on the other hand, on the export volumes of that firm, after entering the international market.

The literature linking the productivity of firms to their export performance is based on the model of firm heterogeneity developed by Melitz (2003). His model suggests that for a given country, in every industry, there is a number of differentiated companies in terms of product variety, and in terms of productivity level. By entering the domestic market, each firm finds its productivity level and only those with a level of productivity allowing them to make gross profits that could cover fixed production costs remain in the market. In contrary, firms with low productivity levels disappear.

Similarly, there are fixed costs associated with export activities, additional to the fixed production costs necessary to stay in the domestic market. The decision of a firm to export comes after the discovery of its productivity. As a result, a firm decides to export if and only if its profits resulting from its export activities to another country are sufficient to cover its fixed export costs. The magnitude of the firm exports and thus its profits are linked in turn to its level of productivity.

In his model, Melitz does not explain the source of the productivity differential between firms. Some models in the literature investigate the source of productivity heterogeneity across firms (Manasse and Turini 2001 Yeaple 2005 or Melitz and Costantini 2007 provide examples).

Nevertheless, although most of these models point to a causality going from productivity to exports, the empirical literature suggests a causality that might go the other way: exports in turn, might increase productivity. In fact, the proof of the nature of the relationship between exports and productivity are not conclusive, particularly for developing countries. For example, Clerides et al. (1998) find an effective self-selection of firms to become exporters, using data from Colombia, Mexico and Morocco. Bigsten et al. (2004) find the opposite, however in four

African countries where significant efficiency gains seem to appear from exporting. Bigsten and Gebreeyesus (2008) find evidence of learning by exporting in Ethiopia, although efficiency gains are highly correlated with firm size and state ownership. Similarly, Van Biesebroeck (2005) finds productivity improvements for exporters in a number of African countries due to their participation in the foreign markets. Also, Fernandes and Isgut (2005) find the same result in the case of Colombia and Blalock and Gertler (2004) in the case of Indonesia.

In this chapter, we assume that the decision by the government to privatise a firm constitutes a shock on its productivity, that could in turn affects its exports. In so doing, we offer a quasi-natural experiment linking the firms which experience a switch in the structure of their ownership to their export performance.

To the best of our knowledge, we know about one paper that studies this relationship between ownership and exports, based on Chinese data: Ryuhei, Wakasugi, Hongyong, and Zhang (2012). These authors examine how differences in the structure of productivity and property affect Chinese exporters with different types of ownership: private companies, state-owned enterprises (SOEs) and foreign subsidiaries. Using data of Chinese enterprises, their statistical estimates suggest several conclusions. One conclusion is that the public and private enterprises must be highly productive to engage in export, while foreign-funded enterprises need relatively little productivity for exporters. The authors look at the relationship to FDI as well, which is beyond the scope of this chapter. Importantly, in the Chinese case, it seems that the what matters for exports is not the difference in ownership between private and state-owned enterprise but more between national owned (be it private or SOEs) or foreign owned.

3. Data and Variables

3.1 Datasets

The data used in this study come from the World Bank Enterprise Survey. Through interviews with companies in the manufacturing and service sectors, the Enterprise Survey reports data on the biggest obstacles to business growth, the relative importance of various constraints to increasing employment and productivity, and the effects of a country's business environment on its international competitiveness.

These enterprise level surveys have been conducted since 1990 by different units within the World Bank. Since 2005-06, most of the data collection efforts have been centralized within the Enterprise Analysis Unit.

The basic topics include Enterprise Survey business characteristics, women's participation, access to finance, annual sales, costs of inputs / work, workforce composition, corruption, licensing, infrastructure, trade, crime, competition, capacity utilization, territory and permits, taxation, informality, the relationship business-government, innovation and technology, and performance measures.

In this chapter, we use the survey of firms in the manufacturing sector in Egypt for the years 2008 and 2013. Due to the sensitive issues of the survey of business-government relations and topics related to corruption, private contractors conduct corporate investigations on behalf of the World Bank. The survey is taken by fact with business owners and executives. Sometimes the respondent's business accounting and human resources managers are called in the interview to answer questions about the topics of sales and working the investigation. Sectors of manufacturing and services sectors are the main activity of interest.

The dataset used is a comprehensive one including more than 900 manufacturing firms surveyed in 2008 and 2013. Since some firms are only surveyed in one year, the dataset is imbalanced in this sense. However, 430 companies were present in both 2008 and 2013. Thus, we focus on these firms, specifically to assess the role that the change of ownership between 2008 and 2013 has played in the determination of firms' productivity, export probability and export performance.

3.2 Methodology

Based on new trade theories (Melitz (2004)) and following the empirical literature (see for instance Yoshino (2008 and Redding and Venables (2003)), we derive a firm-level based econometric specification as follows:

$$Y_{it} = \alpha_0 + \sum_h \alpha_{1h} \delta_{ih} + \sum_c \alpha_{2c} \phi_{ict} + \varepsilon_{it}$$

Where Y takes three values in our estimation in 2013 representing respectively: The log of exports, the status of the exporting firm (a dummy variable taking the value of 1 if the firm is an exporter, 0 otherwise), and finally, the log of the total factor productivity of the firm, all of these variables varying across firms and time(indexed by firm i and year t). δ_{ih} are the different ownership variables, ϕ_{ict} represents firm-level controls as the size of the firm being small, medium or a large business and the age of the business. It also includes an information on the size of exports back in 2008. The question being asked indeed is whether or not changes in the ownership structure of the firms between the two years (2008 and 2013) has been beneficial to the exporting activity in this interval. Finally, ε_{it} is a random error term. We use the Ordinary Least Square (OLS) to estimate export intensity, total factor productivity and the probability to export.

3.3 Description of used variables

In this study, we aim to distinguish the effect of the private domestic, public sector, and the foreign ownership on the probability of a firm to enter the foreign market and whether the type of ownership allows exporters to export more. In addition, we explore the effect of ownership and shift between types of ownerships on the total productivity of the firm.

To determine the status of the firm as an exporter or non-exporter, we use the dummy variable *exporter* that takes the value of 1 if the firm is exporting directly or indirectly in the previous fiscal year when it was surveyed, 0 if it has not exported neither directly nor indirectly. For the value of exports, we use the variable *lnexports* which indicates the log of the values of export of a given firm. Moreover, the third dependent variable is the total factor productivity (TFP), represented by *lnTFP*, being the log form of the TFP.

To calculate the TFP, we use a Cobb-Douglas production function, where the variables for estimation are firms' annual sales (Y), labour costs (L), the replacement value of machinery,

vehicles and equipment (K), cost of raw and intermediate materials (M), and the cost of electricity and fuel (E). The residual of the function is the estimated TFP. In my research, I use the costs of factors as a proxy instead of the factors themselves. This is in line with previous research of TFP conducted using the Enterprise survey datasets of developing countries. Except for Labour, the values of the factors: Machinery, intermediate material and electricity and fuel, are lacking in the dataset.

The firms that had missing values for any of these variables are excluded from the analysis. Data such as sales, costs, and the number of employees refer to the last complete fiscal year, not necessarily the year the survey was conducted.

As independent variables, we use a group of dummy variables representing the type of ownership through the biggest type of shareholder of the companies: the dummy *private ownership* takes the value of 1 if the private domestic firms own the largest share of ownership of the firm, the dummy *public ownership* takes the value of 1 if the largest part of the firm's shares is owned by the government, while the dummy *foreign ownership* represents the firms whose shares are mostly owned by foreign investors. The second set of independent variables are those indicating a shift of ownership between the years 2008 and 2013. The variables *pubtopriv*, *privtopub*, *privtoforg* and *fortopriv* indicate respectively the shifts from public to private ownership, private to public ownership, private to foreign and foreign to private ownerships.

Finally, we use a group of variables to present the characteristics of the firms in the datasets: *size* to give an indication of the size of the firm. *Size* takes the value of 0 for firms with less than 5 employees; a value of 1 for firms with employees between 5 and 19; 2 for firms with employees between 20 and 99; and 3 for firms with employees greater than 99 as used in the World Bank enterprise survey. The *lnlagexports* is the log of exports from the previous fiscal year of the dataset, *lnage* and *lnage2* show the log of age and the log of the square of age of the firm respectively in the year it was surveyed.

4. Stylized Facts

In this section, we focus on descriptive statistics that showcase the difference of performance in terms of sales, number of employees and age between exporters in the different categories of ownerships, being mostly privately owned, mostly owned by a foreign investment, by other type of ownership or mostly publicly owned. As the dataset consists of firms observed in both years 2008 and 2013, the table below presents the average of each variable between the two years for each category.

Table 1. Distribution of Firms by Ownership And Characteristics

Firm Ownership Status		Mostly owned by the domestic private sector	Mostly owned by the foreign private sector	Mostly owned by the Government	Mostly owned by others	Total
				(Government or government agency)	(Bank-Investment Fund-Managers or Employees of the firm)	
<i>Exporters in the previous Fiscal Year (FY)</i>		236	21	8	1	272
<i>Non-Exporters in the previous FY</i>		595	12	8	5	624
<i>Total</i>		852	36	16	7	926
<i>Average Number of Employees</i>	<i>Exporter</i>	446.66	729.48	1144.38	n.a.	480.42
	<i>Non-Exporter</i>	76.73	234.83	1384.25	126.8	96.70
	<i>Total</i>	207.83	689.47	1264.31	n.a.	245.39
<i>Average Log of Sales in the Previous FY</i>	<i>Exporter</i>	13.15	14.21	12.32	n.a	13.25
	<i>Non-Exporter</i>	10.48	11.82	11.13	9.35	10.51
	<i>Total</i>	11.23	13.38	11.81	n.a.	11.35
<i>Average Log of Age</i>	<i>Exporter</i>	2.96	2.8	4.15	n.a.	2.99
	<i>Non-Exporter</i>	2.89	3.28	3.57	3.54	2.92
	<i>Total</i>	2.93	2.99	3.86	n.a.	2.95

Table 1 categorises all firms in our sample according to two criteria: Its type of ownership and whether the firm is an exporter or a non-exporter in the year of observation. Accordingly, we compare the average number of employees as an indication of the size of the firm, the average log of the firm's sales in the last fiscal year as a reflection of its whole performance in terms of market operation and lastly, we look at the average age of the firm in the year of observation as a characteristic of the form and to see if there is a trend or a correlation between age and being an exporter, and/or with a specific type of ownership.

In general, 29.4 per cent (272 firms) of the sample consists of exporters in the year of observation versus the rest (624 firms) being non-exporters.

Looking at the total number of firms and their primary differentiation between exporters and non-exporters, we observe first the discrepancy between the average numbers of employees. The average number of employees of an exporter is 480 employees, while for a non-exporter, it is 97 This is less than one fifth of the number compared to an exporting firm.

Similarly, regarding the average log of sales of firms in the last fiscal year, we find that the average log of sales of those who export is larger than non-exporting firms. This includes local as well as international sales; which indicates the overall better performance of exporting firms. Lastly, exporters in general seem to be older firms than non-exporters. This is further investigated in regressions relating age to the decision to export, the level of exports as well as to the total factor productivity. These differences between exporters and non-exporters hold through the various categories of ownership.

In a second step, we look at the different types of ownerships and differences in size, sales and age between them. While the exporter versus non-exporter difference is pronounced in all categories, there appear to be differences between the different ownership structures that might not be always intuitive.

Focusing on the three categories: mostly privately owned, mostly publicly owned and mostly foreign owned, we find that the firms mostly owned by the foreign private sector are bigger in terms of number of employees, have larger sales and are slightly younger than those owned by the domestic private sector. As for firms owned mostly by the public sector, we find that on one hand, the number of employees is larger than those of the private or the foreign sectors, with a large margin. Where the average number of employees of a private sector exporter is 447 and of a foreign sector is 729, the average public sector exporter employs 1144 employees, this is more than 2.5 times of the private sector and more than 1.5 times the foreign sector. The difference is even wider for non-exporter where the average public sector non-exporting firm

employs 1384 employees compared to 77 and 235 in the private and foreign sectors respectively. In the same direction, we find that public sector firms, exporters and non-exporters, tend to be older than these in the private and the foreign sectors. On the other hand, when we compare the sales levels of the three sectors, we observe that the sales of public sector exporting firms are less than these of private and foreign exporters. However, the level of sales of non-exporters in the public sector is almost at the same level of non-exporters in the two other sectors.

5. Empirical Evidence

The first series of regressions in Table (2) investigates the effect of public, private and foreign ownerships on the export performance of Egyptian firms expressed by volume of exports.

Table 2. Impact of Ownership on the log of Exports

VARIABLES	(1) Log Exports	(2) Log Exports	(3) Log Exports	(4) Log Exports	(5) Log Exports	(6) Log Exports	(7) Log Exports	(8) Log Exports
laglnexports (2008)	0.171** (0.072)	0.171** (0.072)	0.168** (0.072)	0.162** (0.071)	0.166** (0.072)	0.159** (0.074)	0.238*** (0.075)	0.238*** (0.075)
lnage	-0.174 (0.367)		-0.144 (0.367)	-0.175 (0.356)	-0.248 (0.371)	0.0401 (0.343)	0.251 (0.370)	
size	3.746*** (0.450)	3.746*** (0.450)	3.784*** (0.457)	3.605*** (0.443)	3.648*** (0.454)	3.605*** (0.447)		
lnage2		-0.0869 (0.184)						0.117 (0.180)
public ownership			-0.0327 (0.058)					
foreign ownership				0.0588** (0.026)				
private ownership					-0.0212 (0.0184)			
privtopub						-5.825** (2.617)	-4.284** (2.136)	-4.275** (2.135)
pubtopriv						-1.905 (2.125)	-1.235 (2.253)	-1.232 (2.253)
privtoforg						5.889*** (1.991)	7.314*** (2.051)	7.308*** (2.050)
forgtopriv						0.629 (1.925)	1.185 (2.251)	1.169 (2.250)
Constant	-2.332* (1.295)	-2.332* (1.295)	-2.457* (1.304)	-2.290* (1.260)	0.0255 (2.426)	-2.851** (1.251)	2.900** (1.194)	2.961** (1.160)
Observations	444	444	444	444	444	444	461	462
R-squared	0.174	0.174	0.175	0.191	0.178	0.209	0.079	0.079

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, *p<0.1

The first series of regressions investigates the effect of public, private and foreign ownerships on the export performance of Egyptian firms expressed by volume of exports. In addition, amongst our variables of interest are the conversion between 2008 and 2013, from private ownership to public ownership, private ownership to foreign ownership, foreign ownership to private ownership and lastly, from private to public ownership. As firm characteristics, we control for the age and the size of the firm in our regressions.

We start in column (1) by using the log of exports in 2008 and the age and size of the firm as control variables. We find that exports back in 2008 is positively and significantly related to current 2013 log of exports where an increase of 1% of the value of the 2008 exports, increases the level of 2013 exports by 17%. The size as a control proves to be significant and positive, and the log of the age is insignificant. In column (2), we substitute the log of age with the log of age raised at the power of two. Again, it does not have a significant effect on the level of exports. Starting from column (3), we introduce our first variable of interest: the percentage of government ownership of the firm, along with the lagged value of exports. The percentage of public ownership of the firm has a negative effect on the exports, however, this effect is not statistically significant. In column (4), we test the effect of the percentage of foreign ownership of a firm on the level of exports. The percentage of foreign ownership of a firm proves to have a positive and statistically significant effect on the level of exports, where an increase of the percentage of foreign ownership by 1, generates a 6% increase of exports. Column (5) uses the percentage of ownership of a firm by the domestic private sector, which does not have a significant effect on the level of exports. Starting from column (6), we introduce the variables of conversion of the majority of the ownership from private to public, public to private, private to foreign and foreign to private. These variables are all dummy variables which take the value of 1 if this switch of ownership happened and 0 otherwise. In column (6), we use the four previously mentioned conversion variables, along with the log of lagged exports, the log of age and the size of the firm. We find that both the switch from a private to a public ownership and from a private to a foreign ownership, both have significant effects on the level of exports. On one hand, if a firm becomes mostly owned by the public sector instead of the private sector, this causes a decrease of the level of exports of the company. On the other hand, the switch of ownership from a majority of private sector to a majority of the foreign sector, boosts exports. In the same manner, in columns (7) and (8), when using different control variables, the two effects of the switch from private to public ownership and from private to foreign ownership stand significant and in the same direction, where private to public is negative and private to foreign is positive. Looking at the two other variables, the switch from public to private

ownership and the switch from foreign to private ownership, stay insignificant in all three columns, (6), (7), and (8).

Looking at the shift of ownership between the years 2008 and 2013, it is evident that firms passing from being mostly privately owned to being SOEs, have witnessed a significant negative effect on their export performance

A significant positive effect is showing from a shift of a firm's ownership from a locally privately owned one to a foreign ownership. This effect can be interpreted through various routes. On one hand, this positive effect can be explained that when a firm is acquired by a foreign investor, it opens a way for the firm to export to foreign markets through linkages with the international subsidiaries or sister companies in other foreign markets. This way the company would be part of the international firm's supply. On the other hand, the foreign-owned Egypt-located firm would benefit from knowledge transfer and boost in operations efficiency from international subsidiaries

Table 3. Impact of Ownership on the Decision to Export

VARIABLES	(1) Exporter	(2) Exporter	(3) Exporter	(4) Exporter	(5) Exporter	(6) Exporter	(7) Exporter	(8) Exporter
lagexporter (2008)	0.409*** (0.151)	0.409*** (0.151)	0.397*** (0.152)	0.382** (0.151)	0.406*** (0.150)	0.374** (0.157)	0.528*** (0.141)	0.518*** (0.141)
lnage	0.015 (0.080)		0.029 (0.080)	0.014 (0.080)	-0.016 (0.079)	0.064 (0.081)	0.087 (0.070)	
size	0.710*** (0.090)	0.710*** (0.090)	0.723*** (0.091)	0.701*** (0.089)	0.689*** (0.091)	0.707*** (0.090)		
lnage2		0.007 (0.040)						0.0294 (0.036)
public ownership			-0.010 (0.001)					
foreign ownership				0.010** (0.004)				
private ownership					-0.010** (0.003)			
privtopub						-1.270* (0.698)	-1.101* (0.652)	-1.088* (0.652)
pubtopriv						-0.185 (0.388)	-0.118 (0.375)	-0.118 (0.374)
privtoforg						0.901*** (0.311)	1.045*** (0.273)	1.034*** (0.272)
forgtopriv						0.085 (0.287)	0.133 (0.317)	0.110 (0.317)
Constant	-2.267*** (0.306)	-2.267*** (0.306)	-2.324*** (0.310)	-2.288*** (0.309)	-1.501*** (0.441)	-2.430*** (0.321)	-1.112*** (0.231)	-1.013*** (0.234)
Observations	415	415	415	415	415	415	431	432

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

This second series of regressions presented in Table 3 shows results for the probability of exports regressions. Again, the table focuses on role played by the different types of ownerships of the private, public and foreign sectors, as well as the conversion of ownership between 2008 and 2013, on the probability of a firm being an exporter. We control for different characteristics of the firm such as its size and the age of the firm. In this respect, we observe that foreign ownership of the firm has a positive and significant effect on the probability of the firm to be an exporter. Similarly, the private ownership has a lower but also significant positive effect on the probability of exporting by a firm.

Regarding the conversion of ownership between 2008 and 2013, a significant negative effect is observed by the shift from private to public ownership on the probability of a firm to export. However, this link is non-existent in the opposite case of shift from public to private ownership. In addition, the shift of ownership from private to foreign ownership seems to have a high significant positive effect on the probability of exporting by a firm.

We start in column (1) by using the lagged status of firm as an exporter dummy variable taking the value of 1 if the firm was an exporter in the previous time point (2013), and the age and size of the firm as control variables. We find that the lagged exporter status has a significant positive effect on the log of exports where the firm being previously an exporter, increases the probability of the firm to be an exporter in 2013. The size as a control proves to be significant and positive, and the log of the age is insignificant. In column (2), we substitute the log of age with the log of age raised at the power of two. Again, it does not have a significant effect on the level of exports. Starting from column (3), we introduce our first variable of interest: the percentage of government ownership of the firm, along with the lagged exporter status. The percentage of public ownership of the firm has a negative effect on the probability to export, however, this effect is not significant. In column (4), we test the effect of the percentage of foreign ownership of a firm on the probability to export. The percentage of foreign ownership of a firm proves to have a positive significant effect on the probability of the firm to export, where an increase of the percentage of foreign ownership by 1, generates an increase of the probability of the firm to export by almost 1 percentage point. Column (5) uses the percentage of ownership of a firm by the domestic private sector, which has a significant negative effect on the probability of the firm to export. An increase of the percentage of private ownership of the firm by 1, decreases the probability of the firm to export by a 0.69 percentage point. Starting from column (6), we introduce the variables of conversion of the majority of the ownership from private to public, public to private, private to foreign and foreign to private. These

variables are all dummy variables which take the value of 1 if this switch of ownership happened and 0 otherwise. In column (6), we use the four previously mentioned conversion variables, along with the log exporter status, the log of age and the size of the firm. We find that both the switch from a private to a public ownership and from a private to a foreign ownership, both have significant effects on the probability of the firm to export. On one hand, if a firm becomes mostly owned by the public sector instead of the private sector, this causes a decrease of the probability of export of the company. On the other hand, the switch of ownership from a majority of private sector to a majority of the foreign sector, boosts the probability to export. In the same manner, in columns (7) and (8), when using different control variables, the two effects of the switch from private to public ownership and from private to foreign ownership stand significant and in the same direction, where private to public is negative and private to foreign is positive. Looking at the two other variables, the switch from public to private ownership and the switch from foreign to private ownership, they stay insignificant on the probability to export in all three columns, (6), (7), and (8).

These results confirms the first results, indicating that, while the private and the foreign ownerships have positive and significant on the probability and volume of exports of firms, foreign ownership has a higher effect in boosting a firm's performance to meet a level of efficiency, competitive enough to allow the firm to penetrate international markets.

In Table 4 below, we regress our variables of interest: percentages of ownership by each type and the dummies of conversion of ownership between 2008 and 2013, on the log of the total factor productivity. The reason of introduction of this third series of regressions is to test the effect of ownership type and conversion of ownership on the total factor productivity of the firm, which theoretically plays a major role in setting out the firm's performance and keeping the fixed costs related to production and exports at a level enabling it to export.

However, as the results suggest, ownership variables as well as witch of ownership dummies have no significant effect on the total factor productivity of firms, except for the case of conversion of ownership from private to public. Although in column (6), the conversion from private to public ownership has a significant negative effect on the log of TFP, this effect does not hold as characteristics variables change in columns (7) and (8).

Table 4. Impact of Ownership on the log of Total Factor Productivity

VARIABLES	(1) Log TFP	(2) Log TFP	(3) Log TFP	(4) Log TFP	(5) Log TFP	(6) Log TFP	(7) Log TFP	(8) Log TFP
lagln_tfp (2008)	-0.083* (0.043)	-0.083* (0.043)	-0.077* (0.043)	-0.081* (0.043)	-0.083* (0.043)	-0.060 (0.045)	-0.033 (0.043)	-0.033 (0.043)
ln_age	0.008 (0.080)		0.012 (0.081)	0.011 (0.080)	0.008 (0.081)	-0.0131 (0.089)	-0.001 (0.082)	
size	0.134** (0.059)	0.134** (0.059)	0.137** (0.060)	0.123** (0.061)	0.133** (0.062)	0.141** (0.062)		
ln_age2		0.004 (0.040)						-0.001 (0.041)
public ownership			-0.004 (0.003)					
foreign ownership				0.003 (0.002)				
private ownership					-0.000 (0.002)			
privtopub						-0.391* (0.202)	-0.343 (0.232)	-0.343 (0.232)
pubtopriv						-0.374 (0.243)	-0.375 (0.254)	-0.375 (0.254)
privtoforg						-0.032 (0.221)	0.073 (0.212)	0.073 (0.212)
forgtopriv						-0.150 (0.135)	-0.112 (0.127)	-0.112 (0.127)
Constant	-0.284 (0.237)	-0.284 (0.237)	-0.297 (0.240)	-0.281 (0.237)	-0.264 (0.326)	-0.203 (0.260)	0.0403 (0.247)	0.0403 (0.247)
Observations	248	248	248	248	248	248	250	250
R-squared	0.027	0.027	0.028	0.030	0.027	0.042	0.018	0.018

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

To conclude, this chapter aims to investigate the relationship between the ownership structure of Egyptian firms and their export performance. In addition, Egypt has undergone a large nationalisation programme which inspired me in this chapter to also look at the effect of the conversion of ownership on the performance of firms in exports.

In doing so, we use the World Bank Enterprise Survey dataset for Egypt in the years 2008 and 2013, and we focus on ownership variables such as the percentage of the major owner being the domestic private sector, the public sector or a foreign ownership. Furthermore, we use dummy variables for conversion of ownership between 2008 and 2013, from private to public, public to private, private to foreign and foreign to private.

Before concluding the results, it is important to note that the descriptive statistics are consistent with the literature and show that on one hand, private and foreign firms have higher sales and a higher number of exporters. On the other hand, we observe that the number of employees shrinks dramatically when comparing public firms to private or foreign firms. This is in line with the literature suggesting that public enterprises tend to employ a large number of labour, without a parallel increase in the output, setting back the productivity of public firms.

The results of this chapter are fourfold: First, we find a positive significant effect of foreign ownership on firms' performance in terms of exports and export probability. This can be linked to the efficiency of operations brought by foreign ownership, the expansion of a firm's network internationally and easing the transport and other logistics of exports.

Second, we find that the switch of ownership from private to public has a significant negative effect on the exports of a firm as well as to probability to export. Furthermore, the results show that a switch of ownership from private to foreign ownership has a positive significant effect on the probability to export and on export performance.

Lastly, when we test the effect of ownership variables on the total factor productivity of firms, we find that only the conversion from private to public ownership has a significant negative effect on the TFP.

Chapter 2: Power Outage and Manufacturing Firms' Export Performance: Evidence from Egyptian Firm-Level Data

1. Introduction

The Manufacturing sector has always played a key role in driving the growth of the Egyptian economy contributing to the value added, creating jobs and exporting to international markets. Between 2000 and 2016, the value added of the sector has contributed on average to 17 per cent of the GDP. After the uprisings of 2011 and the political instability that resulted from the situation, the share of the sector to the GDP declined – diving to a low level of 15.9 in 2012 but gradually recovering. Moreover, the manufacturing sector fosters over 25 per cent of Jobs in the Egyptian market and contributes largely to exports.

However, Egyptian exports including manufacturing exports, faced different headwinds in the past decade starting with the global economic crisis, through the political turmoil between 2011 and 2013 that disrupted the expansion of Egypt's electricity generation capacity, causing it to lag behind the ever-rising demand. The power shortfall has been exacerbated by declining natural gas production and a foreign currency crisis which has restricted the government's ability to pay for fuel, whether imported or produced locally by international oil companies.

The Central bank's decision in November 2016 to float the Egyptian pound, resulting in a sever devaluation of the Egyptian Pound, has contributed to the dollar crisis and the government's ability to subsidize imported power supply.

This power shortage that Egypt faced on the back of the political turmoil between 2011 and 2013 inspired this chapter to look at different variables that represent power infrastructure services at a firm level and attempt to link these variables to firms' productivity, export performance and the probability to enter foreign markets. This chapter aims to investigate the effect that power infrastructure quality and accessibility have on the extensive and intensive export margins of manufacturing firms in Egypt as well as their total factor productivity.

Power outages can negatively impact business activities through different routes: First, the uncertainty and unpredictability of the time of outages and the duration of each outage means a loss of efficiency of production due to interruption of operations, assets being used under their optimal capacity resulting in higher costs of production and ultimately, under-delivery of output level. Moreover, power outages represent an increased coast to the business in order to

meet their output targets and deadlines. Firms require to replace machinery, which was affected by the outages, invest in electrical generators, or finally increasing the costs of manpower to compensate the loss of production incurred due to the power outages. This can be more challenging to small and medium businesses rather than large, well-established businesses. In this context, productivity of businesses is negatively affected, resulting in a decrease of firm's performance and consequently limiting the firm from meeting the necessary cost efficiency and product quality which would allow it to export or enhance its export performance if the business is present in the international market.

Empirical literature often focuses on infrastructure variables from a macro-level approach using static and dynamic panel data models, spatial econometrics, as well as bilateral trade flow and gravity models to measure the impact that infrastructure elements have on export performance.

Two main problems occur when attempting to use the macro-level analysis. On one hand, few countries have macro-data that are reliable enough to produce solid and robust results. In the case of Egypt, infrastructure indicators are available; however, variation over time is very limited for the majority of them; which leaves no room for panel analysis justification.

Using firm-level data from the World Bank's enterprise survey for the years 2008, 2013 and 2016, we attempt to link Egyptian firms' heterogeneity in productivity and characteristics related to the access to power infrastructure dysfunctionalities such as average power outages, losses in sales due to power outages and the possession of power generators. Doing so, we focus on two types of variables related to the provision of electricity: one type external, and the other internal to each firm. External variables represent electricity supply, power outages and the losses occurring due these outages. The internal variable is related to firm's infrastructure and represented by owning a power generator.

First, the chapter estimates the effect of power infrastructure on the probability to export. In a second step, the chapter evaluates how the heterogeneity in characteristics and power accessibility translates into different export performances represented by the volume of exports. Finally, we explore one route of explanation of the effect on export performance through total factor productivity. The following section provides an overview of the power crisis in Egypt, heightened between the years 2012 and 2014. Section 3 lays out the literature review, followed by section 4 explaining the used data, the methodology and the variables.

Stylized facts are presented in Section 5, empirical evidence in Section 6. Section 7 showcases the results. Finally, Section 8 concludes.

2. Overview of The Power Crisis in Egypt

In December 2012, more than 15 power stations were forced to suspend operations on a single day because of fuel shortages. Following the incident, the Egyptian Energy Control Centre released a report, citing a shortage of 4,000MW at noon, driving Egyptian families to opt for flashlights and candles.

In 2013, Egypt's former Prime Minister, Hisham Qandil, has officially declared in a public conference that Egypt is facing an "unprecedented Energy crisis" and has advised citizens and industries to conserve energy and minimise consumption.

Long before the January 2011 uprising, the Egyptian energy grid was inefficiently administered by a weak state that was incapable of implementing a "rational" plan for securing energy.

The government's long-term plan was based on a 10 percent increase in the yearly demand. However, the annual increase exceeded 12 percent. In the last 15 years, the state has added capacities of 10200 megawatts (Mw) generated by thermal power plant, and by the end of 2013 the Egyptian power generation capacities reached 30000 Mw. That this is inadequate for a population of 86 million is apparent when one considers consumption in other countries: South Africa, 44000 Mw, population 48 million; South Korea, 80000 Mw, population 49 million.

Home consumption constituted 40 percent of energy demand; industrial use accounted for around 30 per cent.

Projections for power generation growth were based on optimistic forecasts of natural gas availability. However, these expectations were not borne out. Gas exploration and production companies had signed contracts with the government, entitling them to 50 percent of the produced gas. After the January 2011 uprisings, the government was unable to pay these companies, and they in turn halted their activities.

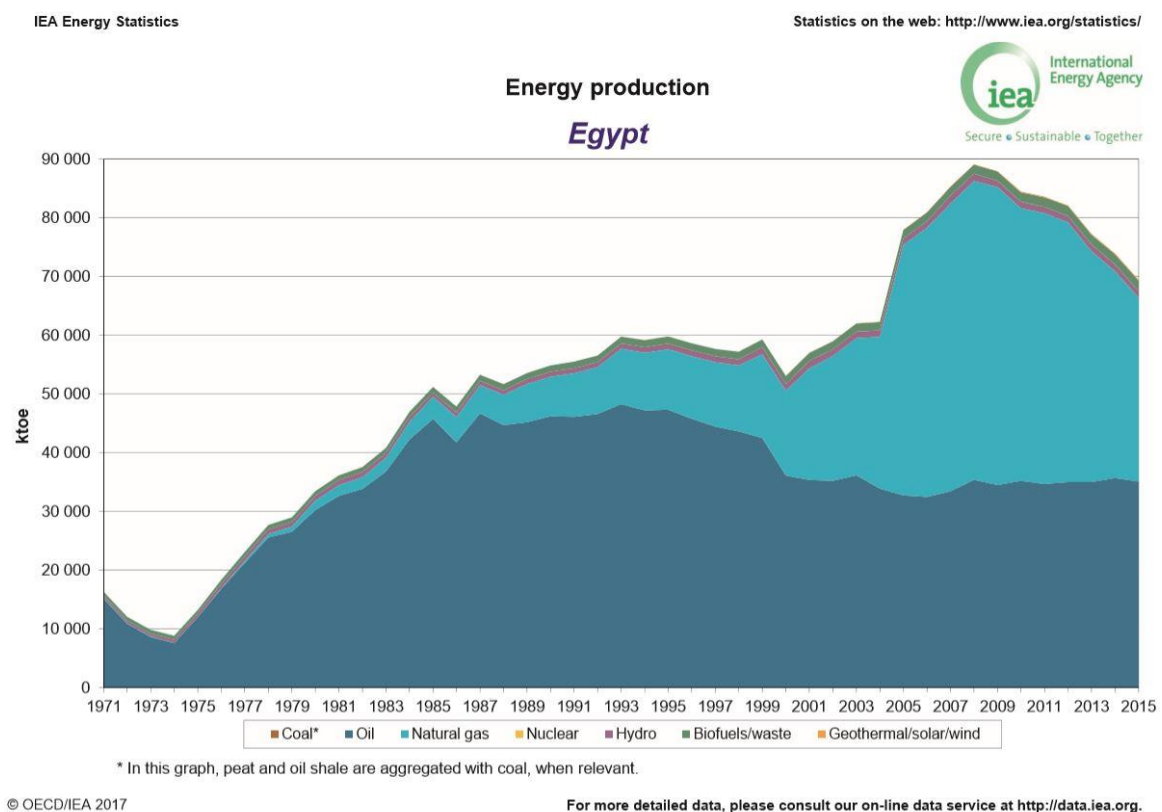
The crisis was made worse by Egypt's inability to secure loans from international banks; which meant that it was unable to build new power plants. As a result, inadequate power grids operated at full capacity to meet increasing demand, and regularly scheduled shutdowns for maintenance were cancelled. This led to decreased efficiencies, shorter lifetimes, and a high risk of power cuts.

By the summer of 2014, Egypt was experiencing one of its most serious energy crises for decades, with parts of the country facing around six power cuts a day for up to two hours at a time.

The blackouts have created widespread frustration, with businesses reporting a downturn in production and citizens complaining about the disruption to everyday life.

Electricity demand hit a record daily high of 27,700 megawatts, 20% more than powers stations could provide, as state media reported, power generation was only 70 percent of capacity, and the crisis seriously threatened the country's economic and services sectors—its businesses, factories, corporations, and hospitals.

Figure 2.1 Egypt's Energy Production



"Have mercy on us," read the front page of Wednesday's al-Gomhoria, a state-owned newspaper, above an article about the electricity shortages.

Egypt also faced a problem of supply. Parts of its own natural gas reserves were notoriously exported at marked-down prices under former dictator Hosni Mubarak. It still has untapped gas fields, but these have traditionally been mined by foreign companies. These firms are reluctant to extract more until they are paid overdue debts owed to them by the Egyptian government.

Meanwhile, Minister Ibrahim Mehleb announced that energy subsidies cost the government about 130 billion pounds a year (approximately \$18.8 billion), or about 10 percent of the GDP, a huge burden on the fiscal budget. His statement suggests that the new government is moving toward restructuring energy subsidization.

In the 2014-15 budget, spending on energy subsidies has been slashed by almost a third and the cabinet implemented a graduated increase of 30 to 55 percent in electricity prices, depending on the consumption category.

The political turmoil of the two years before 2013 has disrupted the expansion of Egypt's electricity generation capacity, causing it to lag behind rising demand.

Hardly a few years after Egypt emerged as an exporter of piped natural gas and liquefied natural gas, the country now needs to import gas for domestic use. The government has tendered for LNG imports, but results have not come out, and the process is taking longer than originally forecast when it was first announced last year. Section 3 lays out the literature review, followed by section 4 explaining the used data, the methodology and the variables. Stylized facts are presented in Section 5, empirical evidence in Section 6. Section 7 showcases the results. Finally, Section 8 concludes.

3. Literature Review

Infrastructure quality has a pervasive influence on all sectors of an economy. Low-quality infrastructure and limited power services increase logistical and production time and cost; rendering products uncompetitive and limiting production optimization and firms' access to local and international markets. The literature linking the productivity of firms to their export performance is based on the model of firm heterogeneity developed by Melitz (2003). His model suggests that for a given country, in every industry, there is a number of differentiated companies in terms of product variety, and in terms of productivity level. By entering the domestic market, each firm finds its productivity level and only those with a level of productivity allowing them to make gross profits that could cover fixed production costs remain in the market. In contrary, firms with low productivity levels disappear.

Similarly, there are fixed costs associated with export activities, additional to the fixed production costs necessary to stay in the domestic market. The decision of a firm to export comes after the discovery of its productivity. As a result, a firm decides to export if and only if its profits resulting from its export activities to another country are sufficient to cover its fixed export costs. The magnitude of the firm exports and thus its profits are linked in turn to its level of productivity.

The literature on the relationship between infrastructure, especially power, and export performance is relatively limited. In India, poor access to electricity and Internet seems to explain 25% of the total factor productivity gap for those firms being impacted (Dollar et al, 2002). Dollar et al (2004) show that power outages are one of the important impediments for firms in Pakistan, Bangladesh and India, and lower for Chinese firms. Subramanian et al (2005) find that utility services interruptions negatively affect firms' performance in China and Brazil. On the contrary, Hallward-Driemeier et al (2006) and Bastos and Nasir (2004) find no evidence on the impact of physical infrastructure on firms' productivity. Şeker (2011) suggests that improvements in regulation, access to finance, and physical infrastructure significantly increase export volumes across countries with different income levels.

From a macro-economic perspective, several studies have proved that access to reliable and quality electricity supply translates to sustainable economic growth, better living standards, lower unemployment and poverty rate Toman & Jemelkoya 2003; Modi et al., 2005; Ozturk, 2010; Bacon & Kojima, 2016; Stern et al., 2017).

Evidence from empirical studies, lend credence to these facts. For instance, Rud (2011) examined the effect of rural electricity provision on industrial output in India and found a significant positive relationship between rural electrification and industrial output. In the same light, Fisher-Vaden et al., (2015) analysed the effects of electricity shortages on firm productivity in China and shows significant output and revenue losses due to outages. Doe and Emmanuel (2016) demonstrated that poor electricity leads to decline in output, revenue and firm's profit in Ghana; Abotsi (2016) also shows that power failure reduces the production efficiency of firms in most African countries; Mensah (2016) found power failure to have a negative effect on manufacturing output in Sub-Saharan Africa (SSA). Despite this overwhelming evidence in the economic literature and government intervention in the sector for many decades, access to quality and uninterrupted electricity supply in Nigeria has continued remained poor.

4. Data, Methodology and Variables

4.1 Data

In this chapter, we use firm-level data on Egyptian manufacturing firms from the World Bank Enterprise Surveys of the years 2008, 2013 and the recently collected in 2016 to study the effect of power outages on firms' export performance. This dataset is comprehensive and representative of Egyptian firms in all governorates, operating in all sectors, categorised by the International Standard Industrial Classification of All Economic Activities (ISIC) codes. In our research, we focus on the manufacturing sectors only given the importance of electricity and hence the impact of its outages on the production levels, productivity and overall performance of these sectors.

Our data set includes 2118 companies: 463 in 2018, 463 in 2023 and 1,192 in 2016, in different subsectors in the manufacturing sector, governorates, and also across the small, medium and large firms.

As for the manufacturing sectors, the dataset is composed of 104 companies from the garments sector, 335 from the textiles sector, 168 from the machinery and equipment sector, 183 from the chemicals, 126 from the electronics sector, 289 from the metal industries sector, 236 from the non-metal industries sector, 142 from the agro industries sector, 134 from the basic metals and metal products sector, 119 companies from the machinery and equipment, electronics and vehicles sector and finally, 282 companies from other industries.

Table 1. Number of Companies by Sector

Sector	Number of Companies
Garments	104
Textiles	335
Machinery and Equipment	168
Chemicals	183
Electronics	126
Metal Industries	289
Non-Metal Industries	236
Agro Industries	142
Basic Metals and Metal Products	134
Machinery and Equipment, Electronics and Vehicles	119
Other Industries	282
Total	2,118

4.2 Methodology

Using the data from 2008, 2013 and 2016, we apply an Ordinary Least Square model to assess the impact of power outages manifested in the number of outages, average length of an outage on three different dependent variables:

$$Y_{it} = \alpha_0 + \sum_h \alpha_{1h} \delta_{ih} + \sum_c \alpha_{2c} \phi_{ict} + \varepsilon_{it}$$

Where Y takes three values in our estimation in representing respectively: The log of exports, the status of the exporting firm (a dummy variable taking the value of 1 if the firm is an exporter, 0 otherwise), and finally, the log of the total factor productivity of the firm, all of these variables varying across firms and time (indexed by firm i and year t). δ_{ih} are the different electricity outages variables (average number of outages in a month, average duration of an outage, ownership of an electrical generator, ownership of an electrical generator x average duration of an outage), ϕ_{ict} represents firm-level controls as the size of the firm being small, medium or a large business and the age of the business, sector and location being in the center or periphery. Finally, ε_{it} is a random error term. We use the Ordinary Least Square (OLS) to estimate export intensity, total factor productivity and the probability to export.

4.3 Variables

In doing so, we set two main hypothesis which are tested using three series of regressions. On one hand, the first hypothesis is that power outage is significant in affecting the level of firm performance expressed in its total factor productivity, total sales and export performance. On the other hand, the second hypothesis focuses on the role which the self-generation of electricity plays to mitigate the negative effect of power outages on the firms' level of performance. Below are the dependant and independent measures used to assess the effect of power outages and electricity self-generation on firms' productivity and export performance:

4.3.1 Dependant Variables

Firm Productivity: We measure the firm's productivity by its' total factor productivity (TFP). In this regard, we estimate the TFP as the residual of the classic production function using OLS technique.

Firm Export Performance: This study considers the firm's decision to export and its volume of exports in measuring the firm's export performance.

In addition, for the databases of 2013 and 2016, we introduce the lagged variables of export volumes (of 2008 and 2013) and of decision to export. By doing so, we account for the lagged effect which the interruption of power supply could have on the production and hence the exports in the longer term.

4.3.2 Independent Variables

Electricity Outage Intensity: Outage intensity in this study measures the average number of outages in a typical month a firm goes without electricity supply from the grid. Another used measure outage intensity is the average number of hours of electricity outages.

Self-generation of Electricity: We use a dummy variable which takes the value of 1 if the firm possesses an electrical generator, used in the cases of power outages of the national grid. It takes the value of 0 if the company didn't invest one. Using this measure, we test the hypothesis that if a firm self-generates electricity, it serves as a mitigating factor in the case of power outages for the risk of productivity and output losses. In addition, we use interaction variables between the possession of an electricity generator and the average number outages occur in a typical month, and between the possession of a generator and the average duration of an outage. These interaction variables aim to measure the effect of electricity outages on the performance of firms which own electrical generators.

Firm Size: We control for firm size by defining classes sizes of employees a. We assign zero (0) to firms with less than 5 employees; one (1) to firms with employees between 5 and 19; two (2) to firms with employees between 20 and 99; and three to firms with employees greater than 99 as used in the World Bank enterprise survey. It is considered that firm size plays a significant role in determining their performance. This is because large firms enjoy economics of scale which allows them to cover their fixed cost more easily and produce goods and services at a lower cost per unit of output. In addition, large firms have access to credit facilities at a lower interest rate due to their high bargaining power (Okafor, 2017).

Firm Age: This measures the number of years a firm has been in existence. The older firms are considered to be more experienced and profitable in tough business environment compared to younger firms that have only existed for a shorter period of time.

Sector: We use sector fixed effects, to differentiate the intensity of impact of the power crisis between different sectors within manufacturing where we expect sectors of higher electrical input to be more effect than those which do not heavily depend on electricity.

5. Stylized Facts

In this section, we present the different characteristics of firms throughout the three years 2008, 2013 and 2016. In addition to the characteristics, we give an idea of electricity supply trends using our two variables: the number of outages and the average duration of an outage. In a second step, we show in parallel the exports of firms in the dataset, the number of exporters and the volume exported out of their total production. The aim of the following descriptive statistics is to serve as a reflection of the dataset trends and characteristics and to allow the introduction of empirical evidence in the following section.

Figure 2.2. Distribution of Firms by Size in 2008, 2013 and 2016

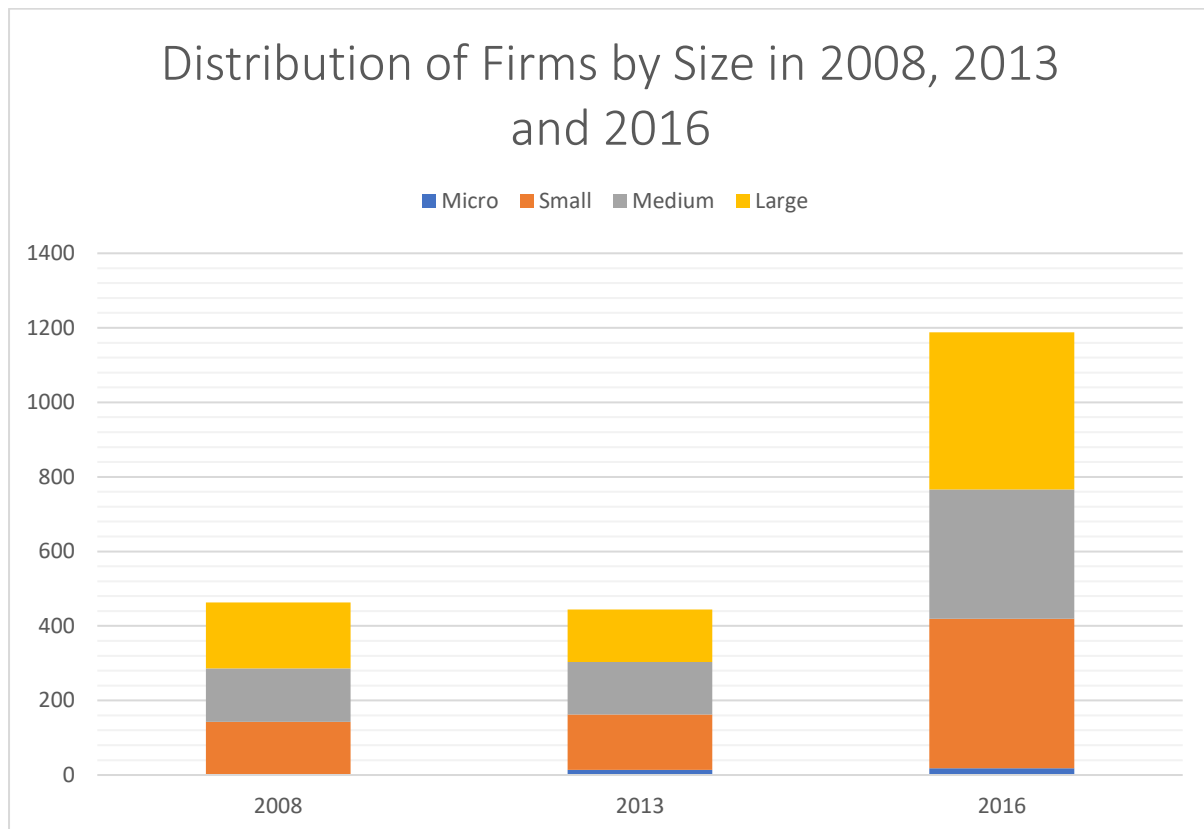


Figure 2.2 presents all the firms in the data sets according to their size in 2008, 2013 and 2016. Size of the firm is defined here by the number of employees where micro firms are those with one to five employees, small firms have six to 19 employees, medium firms have from 20 and up to 99, and finally large firms employing 100 employees and more.

On one hand, As the graph is showing, the number of micro firms in the sample is very low, starting by only one company in 2008, 14 in 2013, reaching only 18 in 2016. On the other hand, it becomes clear from the graph that the majority of firms are constituted of small and medium

firms in all our three data points. Small and medium firms combined, form 62 per cent, 65 per cent and 63 per cent of the total of firms in 2008, 2013 and 2016 respectively. This weight of small and medium businesses in our dataset is crucial to inform the focus on size in our empirical evidence, using the categorial variable of size to show the effect of power supply and shortage on export performance by size of firm.

Regarding large firms employing 100 employees and more, they form 38 per cent, 32 per cent and 36 per cent of total firms in 2008, 2013 and 3016 respectively. Graph (1) shows that through the three years, the dataset structure in terms of size of firms has remained relatively consistent with large firms forming one third of the dataset, the small and medium firms forming almost two thirds of the dataset, and the micro firms being a a very small fraction of the sample.

Figure 2.3. Distribution of Firms by Sector

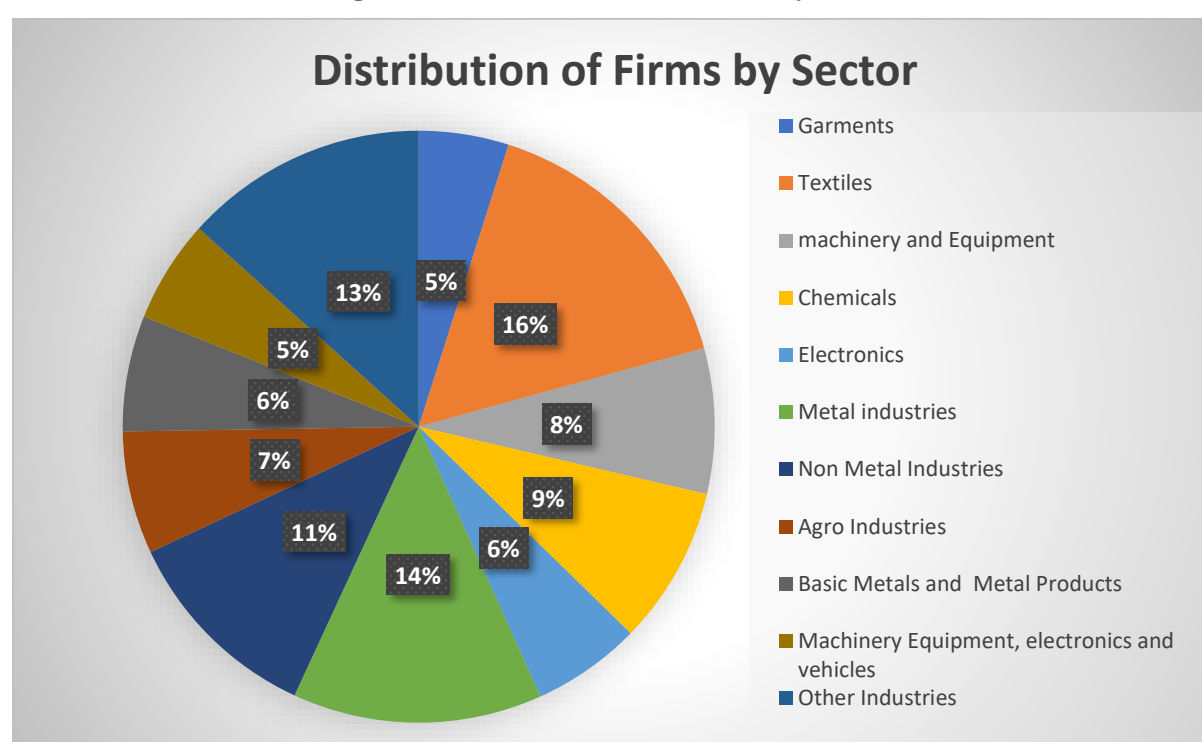


Figure 2.3 presents the distribution of the firms in the sample across all manufacturing sectors in the years 2008, 2013 and 2016. In this regard, two main remarks need to be highlighted: First, As the distribution is formed of all firms in the three time points, we assume in our research that the sector in which the firm is operating has not changed from a year to another. The main product of sales and export might have varied but this does not entail a shift in the operating sector.

Second, as shown in the categories of sectors above in the graph, we have distinct categories of sectors named “Machinery and Equipment”, “Electronics” and “Metal Industries”. However, in the 2016 dataset two more general categories are introduced: “Basic Metals and Metal products” and “Machinery and Equipment, electronics and vehicles”. For the purpose of consistency and to avoid any mistaken re-categorisation of firms into the already defined sectors. We keep firms of the year 2016 under these two categories as they were initially included in the dataset.

Having highlighted these two points, we can see that the highest sector in terms of number of firms in the dataset is the textiles sector including 16 per cent of the dataset’s companies. Excluding the other industries, the textiles sector is followed by the metal and non-metal industries including 14 and 11 per cent of the sample’s firms respectively. The three sectors together contribute to more than 40 per cent of the number of firms in the dataset. This distribution is important as it shows the importance of the textiles, metal and non-metal industries in terms of number of firms but also in the empirical evidence investigation, it will be of interest to highlight the effect of power interruption on the performances of these sectors, especially the metal industries which are perceived as heavy in using power in production.

Table 2. Average Age by Year

Year	Average Age
2008	22.90
2013	24.84
2016	24.91
TOTAL	24.45

Table 3. Number and Percentage of Firms by Region according to 2016 Database

Region 2016	Number Of Firms	Percentage
GREATER CAIRO	329	27.6
WEST DELTA	209	17.53
SUEZ REGION	89	7.47
MIDDLE AND EAST DELTA	263	22.06
NORTHERN UPPER EGYPT	151	12.67
SOUTHERN UPPER EGYPT	98	8.22
FRONTIER	53	4.45

TOTAL	1,192	100
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Table 4. Number and Percentage of Firms by Central or Peripheral Locations

Centre	Number	Percentage
No	1,091	51.51
Yes	1,027	48.49
Total	2,118	100

Tables 2 and 3 show the average age of firms across 2008, 2013 and 2016, as well as the distribution of firms across regions. In Table 4, we observe that the lowest average of age is this of 2008, at almost 23 years, followed by 2013 and 2016 with almost the same average age of firms at 25 years old. We control for the age of firms in our empirical evidence as one the main characteristics of firms.

Table 3 distributes firms by region of firm's location. Greater Cairo includes the largest share of firms in our sample at 27 per cent of firms, followed by the Middle and East delta with 22 per cent of firms. The former and latter regions together form almost 50 per cent of the sample. West Delta includes 18 per cent of firms and the Suez region, a strategic location especially for exporting firms, includes 7 per cent of firms. Upper Egypt, with its Northern and Southern parts form almost 20 per cent of the sample and some 4 per cent belong to the Frontier region. Table 4 categorises the location of the whole dataset in two categories: Centre and Periphery. Centre includes Greater Cairo, Port Said, Suez region and North and East delta, whereas Periphery is the rest of the governorates. It is important to clarify that regions in Table 3 were only added to the survey in 2016 and therefore, data of 2008 and 2013 could not be following the same region categorisation. However, as the centre and Periphery distinction in more general, we constructed table 4 to include 2008, 2013 and also data from 2016 group into these two regions.

Going forward in the summary statistics, we showcase the variables of interest including the volume of exports, the share of exporters by year, the number of electricity outages and the average duration of outages. Lastly, we show the share of companies which invested in an electricity generator in 2008, 2013 and 2016.

Figure 2.4. Number of Electricity Outages and Duration in 2008, 2013 and 2016

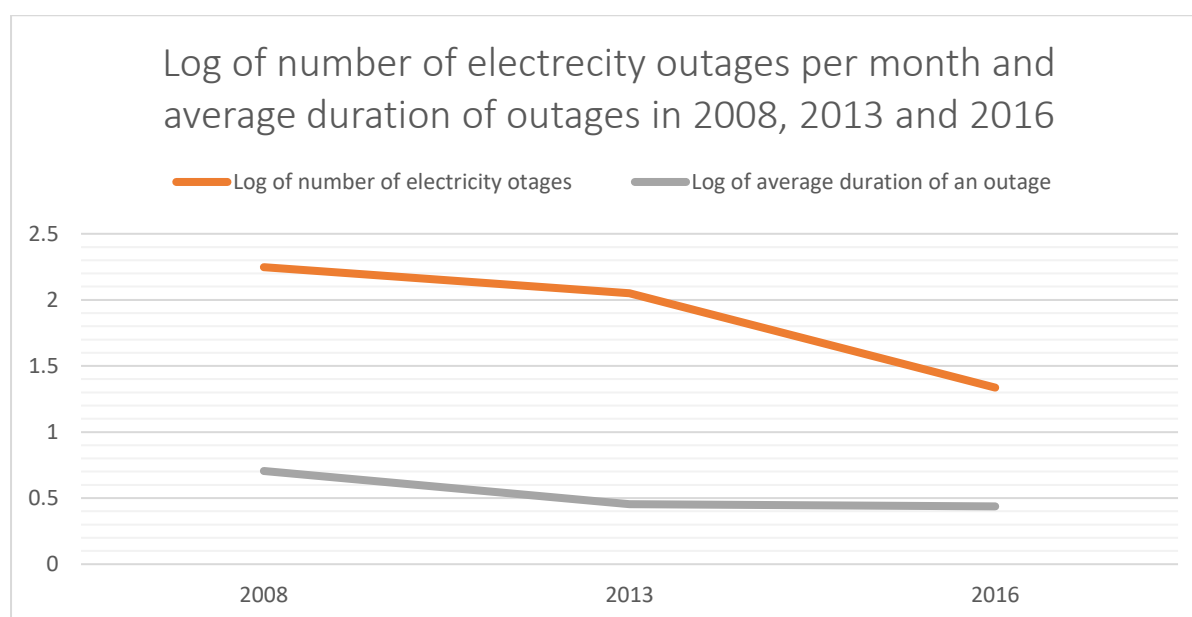
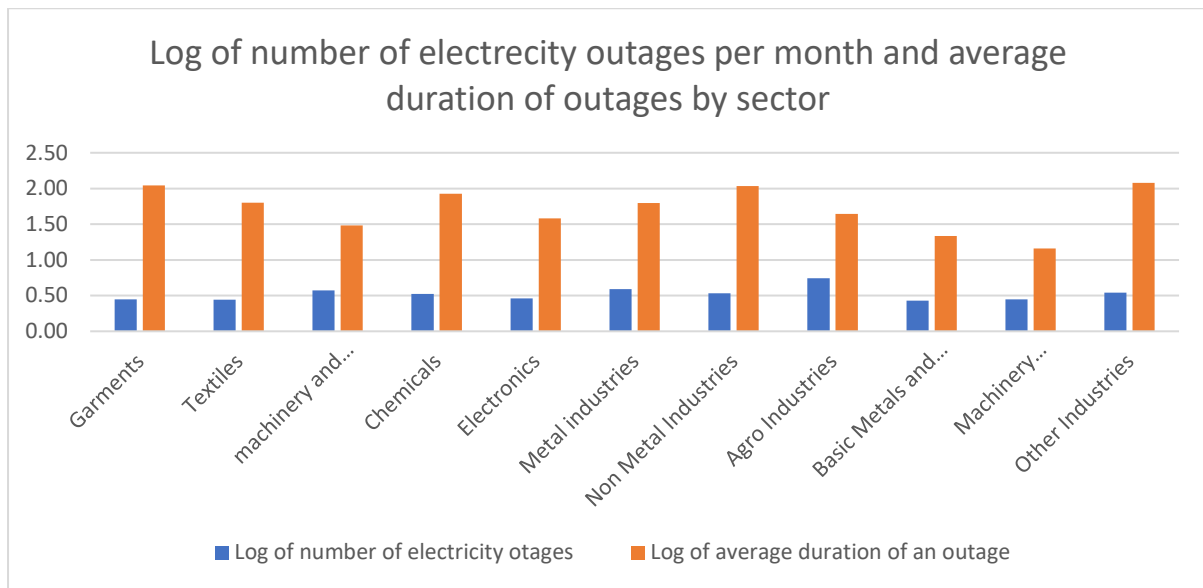


Figure 2.4 presents the average log of two numbers: The number of electricity outages occurring in a typical month and the average duration of an outage, in 2008, 2013 and 2016. As the graph shows, on average, the two parameters have certainly declined in 2016, with the highest number in 2008, declining slightly in 2013 and quickly decreasing to reach their lowest points in 2016.

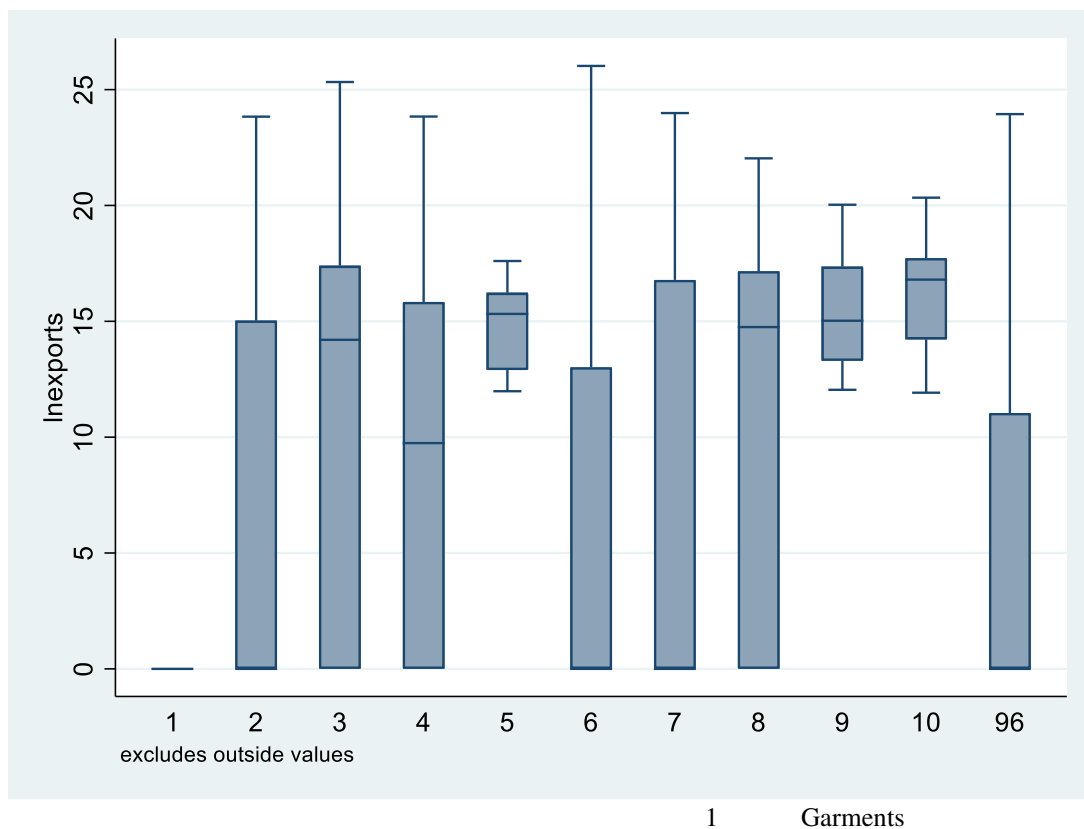
As our analysis focuses on the 2013 crisis and how it affected firms' performances including their exports' volume and decision to export, it is important to dissect these number by sector. By doing so, we showcase the differences of average of both the average duration of an outage as well as the number of outages in each sector, in order to be able to analyse the impact of these outages on exports further in the empirical evidence.

Figure 2.5. Number of Outages and Average Duration by Sector



In Figure 2.5, the averages of both number of outages and the average duration of an outage by sector. On one hand, we observe that the sectors of garments, chemicals and the non-metal industries experienced the highest average of duration of outages. On the other hand, metal and agro industries seem to be experiencing the highest number of electricity outages on average.

Figure 2.6. Boxplots of Log of Exports by Sector



1 Garments

2	Textiles
3	Machinery
4	Chemicals
5	Electronics
6	Metal Industries
7	Non-metal Industries
8	Agro Industries
9	Basic Metals and Metal products
10	Machinery and Equipment, Electronics and Vehicles
96	Other Industries

Figure 2.6 includes the boxplots of log of exports of all firms in the dataset by sector. We chose to use the boxplot as it gives a better understanding of the distribution of the log of exports, the median and the sectors with higher medians and high or low concentration of exports. In this context, the highest medians are observed in the sectors “Electronics” and the “Machinery and Equipment, Electronics and Vehicles”. For the highest figure, the first figure of the first percentile, it is clear that the metal industries sector has the highest value in terms of volume of exports, however, looking at its median, we find it at zero, meaning that only 50 per cent of exports of this sector have the value greater than zero. Similarly, the median of the textiles, non-metal and other industries stand at zero.

6. Empirical Evidence

In this section, we present the empirical evidence of the impact of electricity outages on the level of exports, the decision to export, and finally we test if the outages affect a firm's total factor productivity. In this context, as independent variables, we use several variables representing the electricity outages. The first variable is the number of power outages in atypical month, the second variable is the log transformation of the number of outages in a typical month. As the number of power outages in a typical month for many firms in dataset appeared to be zero or close to zero, we altered the variable to be "one plus the number of power outages in a typical month", taking into consideration that this transformation is shifting the variables distribution, however, this transformation allows the values close to zero to be taken into account in the regressions and hence, influence the impact of the number of outages on our dependent variables. Therefore, the third variable is the log transformation of one plus the number of power outages in a typical month. This is followed by the log transformation of the average total number of hours of power outages in a typical month. One of the variables which is expected to play a mitigating role in alleviating the impact of outages on exports is the ownership of an electrical generator. The sixth variable is, therefore, a dummy variable taking the value of one if the firm owns totally or partially an electrical generator, and zero otherwise. The seventh variable is an interaction of the electrical generator ownership dummy with the log transformation of the number of power outages in a typical month. The eighth and final independent variable used in the three series of regressions is an interaction variable of the electrical generation ownership dummy with the log transformation of one plus the average total number of hours of power outages in a typical month. In addition to the variables, we control for firm characteristics such as the age and the size expressed in categories: 0 for firms between 5 and 19 employees, 1 for firms with 20 to 49 employees, 2 for firms with 50 to 99 and 3 for firms with 100 employees and above. For fixed effects, we include in all regressions the following aspects: The year, the sector and the location of the firm being 1 if the firm is in a central governorate, 0 otherwise.

Table 6.1: Impact of electricity outages on the Log of exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	log of exports	log of exports	log of exports	log of exports	log of exports	log of exports	log of exports	log of exports	log of exports
Number of power outages in a typical month	-0.004 (0.006)								
log of number of power outages in a typical month		-0.340* (0.196)			-0.356* (0.196)			-0.400* (0.221)	
log of (1+number of power outages in a typical month)			-0.413** (0.172)						
log of average number of hours of power outages in a typical month						-0.197 (0.175)			
log of (1+average number of hours									

of power outages in a typical month)				-0.265** (0.129)			-0.270** (0.128)		-0.332** (0.146)
Total or partial ownership of an electrical generator					0.896** (0.38)	1.389*** (0.5)	1.057*** (0.36)	0.654 (0.679)	0.807* (0.454)
Generator ownership *log of Number of power outages in a typical month								0.155 (0.359)	
Generator ownership *log of (1+average number of hours of power outages in a typical month)									0.205 (0.226)
age	-0.002* (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.001)
size	3.490*** (0.249)	3.261*** (0.279)	3.508*** (0.254)	3.415*** (0.254)	3.112*** (0.285)	2.915*** (0.314)	3.216*** (0.262)	3.097*** (0.287)	3.181*** (0.265)
N	899	755	875	861	755	654	861	755	861
R-sq	0.389	0.399	0.395	0.384	0.403	0.32	0.39	0.403	0.391

year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
center	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard errors in parentheses									
* p<0.1, ** p<0.05, *** p<0.01									

Table 6.1 above of empirical evidence represents the first series of regressions which assess the impact the outages, their number, the average total number of hours, the ownership of an electrical generator on the log transformation of exports. Column (1) includes only the number of power outages in a typical month as an independent variable. As the column shows, the number does not have a significant effect on the log of exports of the firm. In column (2), we consider the effect of the log of the number of power outages in a typical month, and it proves to be a significant negative effect where the increase of the number of power outages in typical month by 1%, decreases the exports of a firm by 0.34%.

In column (3), we introduce the variable “1+the number of power outages in a typical month”, which has a significant negative effect on the level of exports of a firm. An increase of 1+the number of power outages in a typical month by 1%, decreases the level of exports of a firm by 0.413%. In column (4), we use the log of “1+average total of number of hours of power outages in a typical month”, which has a significant negative effect on the level of exports, where a 1% increase of the variable, decreases the level of exports by 0.265%. In column (5), we re-use the log of the number of power outages in a typical month, while simultaneously introducing the dummy variables of electrical generator ownership. In this column, we find that the log of number of outages in a typical month, has a negative effect on the log exports. An increase in the number of outages in a typical month by 1%, decreases the level of exports by 0.365%. The effect of ownership of an electrical generator proves to have a positive effect on the export level of the firm, where a firm which partially or totally owns an electrical generator has an almost 90% higher level of exports than a firm that does not own an electrical generator.

In column (6), we introduce the log of the average total number of hours of power outages in a typical month, along with the dummy of electrical generator ownership. In this regression, we find that the log of the average total of number of outages in a month does not exert a significant effect on the level of exports. However, the ownership of an electrical generator proves again to be significant with a high level of impact of 140% difference in exports between a firm which owns a generator and a firm which does not. The magnitude of the effect appears relatively high. This might not be the result of a mitigation effect *per se*, but is also consistent with the idea that firms which own powergenerators are already relatively performant exporters for some reason (being a foreign affiliate for instance) which explains the big 140% figure. Column (7) uses the log of “1+average total number of hours of power outages in a typical month” and the dummy variable of electrical generator ownership. In this column, we find that the log of “1+average total number of hours of electricity outages in a typical month” has a negative significant effect on the level of export, where an increase of 1% of the variables,

decreases exports by 0.27%. As for the electrical generator dummy, taking the value of 1, increases the level of exports by almost 106%. Column (8) builds on column (5), where we use the log of number of power outages in a typical month, the electrical generator dummy, adding to it the interaction variable of the ownership of a generator dummy with the log of number of power outages in a typical month. As a result, we find that only the log of number of outages has significant effect, with a negative direction, where an increase of the number of outages by 1%, decreases the exports by the firm by around 0.4%. Finally, column (9) considers the effects of the “1+average total number of hours of power outages in a typical month”, the dummy variable representing the ownership of an electrical generator, and the interaction between “1+average total number of hours of power outages in a typical month” and the dummy variable of an electrical generator ownership. The 1+average of total number of hours of outages in a typical month proves to be negatively and significantly affecting exports in this regression with an increase of 1% causing a decrease of 0.33% if exports. As previously proved, the ownership of a generator has positive significant effect where the partial or total ownership of 1, increases the exports by 81% compared to the firm not owning a generator. However, the interaction variable does not seem to have a significant effect on the exports of a firm.

Throughout the nine regressions, the age of the firm as a characteristic does not prove to influence the exports of this firm, except in column (1) where it has a negative effect. Contrarily, the size of the firm has a strong significant positive effect on the level of exports in all the regressions.

Table 6.2: Impact of electricity outages on decision to export

	(1) Exporter	(2) Exporter	(3) Exporter	(4) Exporter	(5) Exporter	(6) Exporter	(7) Exporter	(8) Exporter	(9) Exporter
Number of power outages in a typical month	-0.000 (0.000)								
log of number of power outages in a typical month		-0.024** (0.011)			-0.025** (0.011)			-0.023* (0.012)	
log of(1+number of power outages in a typical month)			-0.032*** (0.010)						
log of average number of hours of power outages in a typical month						-0.010 (0.010)			
log of (1+average number of hours of power outages in a typical									

month)				-0.025*** (0.007)			-0.025*** (0.007)		-0.024*** (0.008)
Total or partial ownership of an electrical generator					0.053*** (0.020)	0.066*** (0.024)	0.064*** (0.020)	0.064 (0.040)	0.071** (0.028)
Generator ownership *log of Number of power outages in a typical month								-0.007 (0.021)	
Generator ownership *logof(1+average number of hours of power outages in a typical month)									-0.004 (0.013)
age	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
size	0.227*** (0.013)	0.216*** (0.014)	0.229*** (0.013)	0.222*** (0.013)	0.208*** (0.014)	0.178*** (0.016)	0.211*** (0.014)	0.209*** (0.014)	0.212*** (0.014)
N	1233	1071	1193	1176	1071	872	1176	1071	1176
R-sq	0.226	0.213	0.230	0.229	0.218	0.202	0.236	0.218	0.236
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
center	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6.2 above presents the second series of regressions in the empirical evidence section, where we use the same set of independent variables, firm characteristic controls and fixed effects, with the dependent variable being the decision of the firm to export, taking the value of 1 if the firm exports and 0 otherwise.

In a nutshell, besides their found impact on individual exports values (table 6.1), power outages appear to have negative effects on the decision to exports as well. To be more precise, column (1) includes only the number of power outages in a typical month as an independent variable. As the column shows, and to begin with, the number of power outages when expressed in absolute values, does not have a significant effect on the decision to export of the firm. In column (2), when considering the long term, the number of outages produces a significant negative effect on the export decision of a firm where the increase of the number of power outages in typical month by 1%, decreases the export probability to occur.

In column (3), we introduce the variable “1+ the number of power outages in a typical month”, which has a significant negative effect on the export decision of a firm. An increase of 1+the number of power outages in a typical month by 1%, decreases the probability of a firm to export. In column (4), we use the log of “1+average total of number of hours of power outages in a typical month”, which has a significant negative effect on the export decision, where a 1% increase of the variable, decreases the probability to export. In column (5), we re-use the log of the number of power outages in a typical month, while simultaneously introducing the dummy variables of electrical generator ownership. In this column, we find that the log of number of outages in a typical month, has a negative effect on the probability to export. An increase in the number of outages in a typical month by 1%, decreases the level of exports. The effect of ownership of an electrical generator proves to have a positive effect on the export decision of the firm, where a firm which partially or totally owns an electrical generator has higher probability of export than a firm that does not own an electrical generator.

In column (6), we introduce the log of the average total number of hours of power outages in a typical month, along with the dummy of electrical generator ownership. In this regression, we find that the log of the average total of number of outages in a month does not exert a significant effect on the probability of a firm to export. However, the ownership of an electrical generator proves again to be significant with a high level of impact in probability to export between a firm which owns a generator and a firm which does not. Column (7) uses the log of “1+average total number of hours of power outages in a typical month” and the dummy variable of electrical generator ownership. In this column, we find that the log of “1+average total number of hours of electricity outages in a typical month” has a negative significant effect on

the decision to export by a firm, where an increase of 1% of the variables, decreases exports. As for the electrical generator dummy, taking the value of 1, increases the probability to export by 6.4 percentage points. Column (8) builds on column (5), where we use the log of number of power outages in a typical month, the electrical generator dummy, adding to it in column (8) the interaction variable of the ownership of a generator dummy with the log of number of power outages in a typical month. As a result, we find that only the log of number of outages has significant effect, with a negative direction, where an increase of the number of outages by 1%, decreases the export probability of a firm. Finally, column (9) considers the effects of the “1+average total number of hours of power outages in a typical month”, the dummy variable representing the ownership of an electrical generator, and the interaction between “1+average total number of hours of power outages in a typical month” and the dummy variable of an electrical generator ownership. The 1+average of total number of hours of outages in a typical month proves to be negatively and significantly affecting export’s decision in this regression with an increase of 1% causing a decrease of probability. As previously proved, the ownership of a generator has positive significant effect where the partial or total ownership of 1, increases the probability to export compared to the firm not owning a generator. However, the interaction variable does not seem to have a significant effect on the exports of a firm. Throughout the nine regressions, the age of the firm as a characteristic does not prove to influence the exports of this firm. However, the size of the firm has a strong significant positive effect on the level of exports in all the regressions.

In Table 6.3 below, we regress our variables of interest on the log of the total factor productivity. The reason of introduction of this third series of regressions is to test the effect of electricity outages and conversion of ownership on the total factor productivity of the firm, which theoretically plays a major role in setting out the firm’s performance and keeping the electricity fixed costs related to production and exports at a level enabling it to export.

However, as the results suggest, electricity variables have no significant effect on the total factor productivity of firms.

Table 6.3: Impact of electricity outages on Log of Total factor Productivity

	(1) Log TFP	(2) Log TFP	(3) Log TFP	(4) Log TFP	(5) Log TFP	(6) Log TFP	(7) Log TFP	(8) Log TFP	(9) Log TFP
Number of power outages in a typical month	0.004*** (0.001)								
log of number of power outages in a typical month		0.007 (0.025)			0.007 (0.025)			0.010 (0.029)	
log of(1+number of power outages in a typical month)			-0.004 (0.024)						
log of average number of hours of power outages in a typical month						0.004 (0.024)			
log of (1+average number of hours of power outages in a typical									

month)				0.014 (0.017)			0.014 (0.017)		0.022 (0.020)
Total or partial ownership of an electrical generator					0.023 (0.073)	0.012 (0.088)	0.039 (0.070)	0.045 (0.129)	0.092 (0.097)
Generator ownership *log of Number of power outages in a typical month								-0.011 (0.054)	
Generator ownership *logof(1+average number of hours of power outages in a typical month)									-0.027 (0.036)
age	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
size	0.116*** (0.032)	0.101*** (0.033)	0.115*** (0.033)	0.112*** (0.032)	0.097*** (0.035)	0.109*** (0.042)	0.105*** (0.034)	0.097*** (0.035)	0.105*** (0.034)
N	943	817	929	915	817	652	915	817	915
R-sq	0.072	0.061	0.043	0.056	0.061	0.062	0.056	0.062	0.057
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
center	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
 * p<0.1, ** p<0.05, *** p<0.01

Table 6.4: Conditional Logit model to the firm's decision to export

	Exporter (1)	Exporter (2)	Exporter (3)	Exporter (4)	Exporter (5)	Exporter (6)	Exporter (7)	Exporter (8)	Exporter (9)
Number of power outages in a typical month	-0.003 (0.003)								
log of number of power outages in a typical month		-0.103 (0.07)			-0.118* (0.071)			-0.075 (-0.088)	
log of (1+number of power outages in a typical month)			-0.162** (0.067)						
log of average number of hours of power outages in a typical month						-0.039 (0.065)			
log of (1+average number of hours of power outages in a typical month)				-0.138*** (0.049)			-0.139*** (-0.049)		-0.148** (0.063)
Total or partial					0.556***	0.747***	0.644***	0.783**	0.604**

ownership of an electrical generator					(0.187)	(0.214)	(0.175)	(0.335)	(0.251)
Generator ownership									
*log of Number of power outages in a typical month								-0.12 (0.147)	
Generator ownership									
*log of (1+average number of hours of power outages in a typical month)									0.022 (0.098)
age	-0.003 (0.003)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.003)	-0.003 (0.004)	-0.002 (0.003)	-0.002 (0.003)	-0.002 (0.003)
size	1.534*** (0.108)	1.487*** (0.117)	1.512*** (0.109)	1.499*** (0.11)	1.405*** (0.12)	1.247*** (0.133)	1.389*** (0.114)	1.407*** (0.121)	1.389*** (0.114)
N	1233	1071	1193	1176	1071	872	1176	1071	1176
sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard errors in parentheses									
* p<0.1, ** p<0.05, *** p<0.01									

In Table 6.4 above, we apply a conditional Logit model, using the sector in which firms operate as the fixed effect, to estimate the effect of power outages and the ownership of an electrical generator on the decision of the firm to export. In this context, we find the results consistent of those of the OLS model, where the total number of hours of power outages a firm experiences in a typical month, proves to be have a negative effect that is significant on the decision of a firm to export. Moreover, the number of outages in a typical month negatively and significantly impact this decision of exporting. As for the ownership of an electrical generator, it is consistently proving to be positive and significant in its impact on the decision of exporting by a firm.

7. Conclusion

In conclusion, this chapter is looking to research the effect of electricity and power outages on Egyptian firms' export performance. To investigate this relationship, we use the World Bank Enterprise Survey for Egypt for the years 2008, 2013 and 2016. Our variables of interest are the number of electricity outages in a typical month, the number of hours the outages lasted in a typical month and lastly, the ownership, partial or total, of an electrical generator by a firm. We run three series of regressions where the dependant variables are the log of exports, the probability to export and the total factor productivity, respectively.

Results show that the number of outages in a typical month as well as the number of hours of outages in a typical month, have a negative significant effect on the export performance of Egyptian firms. However, we find that these effects do not exist when we test them on the total factor productivity of firms. Interestingly, we find the negative effect of outages on export performance, but not via the nexus of total factor productivity. More research is needed to understand how power outages can be producing such result on export performance, independently from TFP. Maybe the way we measure TFP or the values used to measure it are not good enough to account for the true productivity of the firms. Another reason might be related to the impact of outages on the export activities per se (independently from production activities): for instance, if the managers of export activities are inhouse or the latter are being subcontracted to other intermediary import/export companies, and to the extent that the effect of power outages is being more pronounced on these services activities then one could also obtain results that are consistent on our manufacturing firms exports via such channels.

Chapter 3: The Impact of Political Instability on Egypt's Exports: Evidence from Firm Level Data¹²

1. Introduction

Egyptian foreign trade figures have deteriorated abruptly after the 2008 crisis, and then continued to go down since the Arab Spring and terrorism events after 2011. Exports and imports with respect to GDP have been reduced by 15 to 25% since 2011. One of the reasons behind such a deterioration is riots and other forms of violence, including acts of terrorism that might be responsible of Egypt's loss of competitiveness. Following the Armed Conflict Location & Event Data (ACLED) dataset, a dataset at our disposal which lists all violent events by date, and type (riots/terrorism/other violence), Egypt experienced around 6,200 violent events since 2011, about 4500 of which are related to riots/protests.

Therefore, this chapter aims at studying the extent to which conflicts and tensions in Egypt are explaining these dramatic losses in competitiveness. More particularly, the objective is to open the black box to see how firms reacted to the events during the turmoil, in terms of the volumes and values of firm exports on one hand and prices charged, on the other hand.

The Egyptian case is very interesting for several reasons. First, the period 2011 to 2014 witnessed many demonstrations and protests along with terrorism acts, the latter having extended to 2015. This has constituted an important shock for Egypt, following that of the world financial crisis in 2008-2009. While the latter had hit the world economy thus reducing world demand, the former events have been more localized in Egypt (and in some of the Middle East and North Africa (MENA) region countries). Nevertheless, during the same period, other shocks hit the Egyptian Economy like the Egyptian currency depreciation, violence in neighborhood countries and the debt crisis in the European Union (EU). One way to identify more clearly the impact of the Egyptian Arab Spring and terrorism events inside Egypt on the export performance of its firms is to consider events at the monthly level and match these with monthly export data of firms. More interestingly, in order to identify more neatly the effect of our conflicts variables we draw on some further information about the potential locations of

¹ This chapter has benefited from a financial support from the Egyptian Center for Economic Studies, Cairo, Egypt.

² This chapter has been co-written with M. Daniel MIRZA (Université de Tours) and M. Chahir ZAKI (Université du Caire)

firms across Egyptian governorates (through the World Enterprise Survey from the World bank). Together with the geo-localization of the events in the ACLED data, we could then build a measure of the potential exposure to monthly events faced by each of our firms in the firm-level dataset provided by the General Organization of Exports and Imports Control (GOEIC).

There is a growing literature on the economic consequences of war and terrorism acts on international trade (see for instance Blomberg and Hess (2006), Verdier and Mirza (2008, 2014, 2018), Anderson and Marcouiller (2003), Glick and Taylor (2010), Martin, Mayer and Theonig (2008), Karam and Zaki (2016)). In these studies, the idea put forward is that different types of conflicts may affect individual economic decisions by increasing both, transaction costs on one hand and, on the other hand, feelings of uncertainty, fear, and risk aversion³. An influential paper by Abadie and Gardeazabal (2003) found a sizable and long-lasting (equal to 10 percentage points) drop in the GDP of the Basque region due to the ETA related conflicts over the period 1968-2000, using as a counterfactual a synthetic control group drawn from other Spanish regions. An important share of the literature models wars and/or terrorism acts as provoking a reduction in productivity, or an increase in transaction costs as natural channel through which the economic activity might be affected. Another strand evokes uncertainty.

Yet, it is important to note that most of the work in the literature is undertaken on yearly based data. To the best of our knowledge, no work has been undertaken so far on the short-term effects of conflicts on the firm level trade of a developing country. Crucially, we want to see by how much, high frequency conflicts are affecting developing countries' performance in the short run.

On the theory side, a firm being exposed to revolution acts on one hand, or terrorism acts, on the other hand, is expected to experience a cut in its production capacities (cuts in factors of production: employment hours decrease together with more electricity and water cuts) and/or shipment capacities (army checkpoints, roadblocks by rioters, disorganization of seaports and airports, etc.). At given demand in foreign destinations, this should be increasing the costs of the firms and, through higher induced prices, should reduce in turn quantities that are shipped to these destinations. This is why it is important to have access to quantities and prices in order to be able to identify these channels with our data.

³ See Sandler and Enders, 2012 on issues linked to security related transaction costs and Becker and Rubinstein, 2011 for issues related to fear and risk aversion

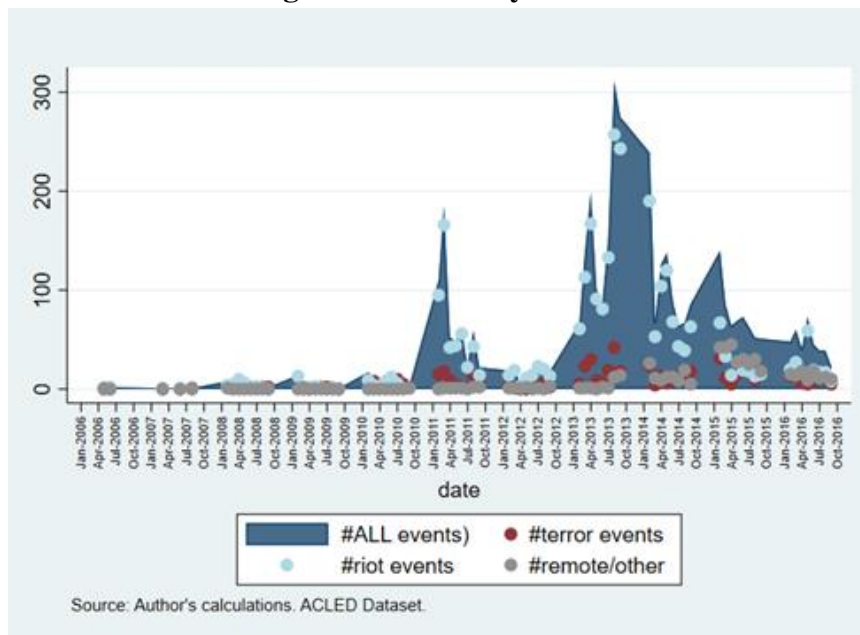
Our main findings show that the intensive margin of trade is negatively affected by those events. This effect is more pronounced for small firms followed by medium ones for both the quantities and the values of exports, though stronger for quantities. Egyptian exporters tend also to reallocate their exports from destination where they face a fiercer competition during period of political instability. Moreover, unit values experience an increase, notably for small and medium exporters. Big exporters in turn, seem to gain exports from these events, possibly because they can overcome more easily the burden of the shock and thus could offer products that replace the undelivered ones by smaller firms. Another reason, is that demand reductions in Egypt due to the events, might incite big exporters to ship out of the country their unsold products where demand has not been affected *a priori*.

The chapter is organized as follows. Section 2 presents some stylized facts. Section 3 explains the theoretical framework with the main model predictions. Section 4 is dedicated to the methodology and data. Section 5 presents the empirical findings and Section 6 concludes.

2. Stylized Facts

This section provides some stylized facts on the revolution episode and trade performance in Egypt. Figure 3.1 shows the surge of events in the wake of the political turmoil of 2011. Indeed, while most of these events were chiefly riots⁴ (blue dots) followed by terrorism events⁵ (red dots), they were concentrated in specific periods of time with the highest level after the ouster of the Islamist President Mohamed Morsi in June 2013. Other events⁶ were more frequent but very limited in terms of their number (the gray dots in Figure 1).

Figure 3.1. Monthly Events



If we look at the fatalities associated to monthly riots (see Figure 3.2), one can notice that they were also concentrated either during the revolution of January 2011 (especially after the death of 74 individuals in a match in Port-Said in February 2012); during the anti-Morsi demonstrations that took place in the first half of 2013 and other clashes that took place in August 2013 (see Figure 3.3). Another important fact to notice and recall when reading our econometric work is that, the number of monthly fatalities and that of monthly events are hardly

⁴ Riots (Violent events where demonstrators or mobs engage in disruptive acts or disorganised acts of violence against property or people);

⁵ Terrorism means violence against civilians, violent events where an organized armed group deliberately inflicts violence upon unarmed non-combatants).

⁶ Other events include the following: *Demonstrations*: A public demonstration against a political entity, government institution, policy or group in which the participants are not violent; *Strategic development*: accounts for often non-violent activity by conflict and other agents within the context of the war/dispute. Recruitment, looting and arrests are included; *Battles*: Violent interactions between two organised armed groups; *Explosions/Remote violence*: One-sided violence events in which the tool for engaging in conflict creates asymmetry by taking away the ability of the target to respond.

correlated, except for some few events cited above. Another important feature of the data is that number of monthly events vary much more than the number of fatalities. This is why the former seems then to be a better indicator of variations in tensions and political instability that would affect the activity of firms than the information that would be delivered by the number of fatalities.

Figure 3.2. Monthly Riots and their fatalities

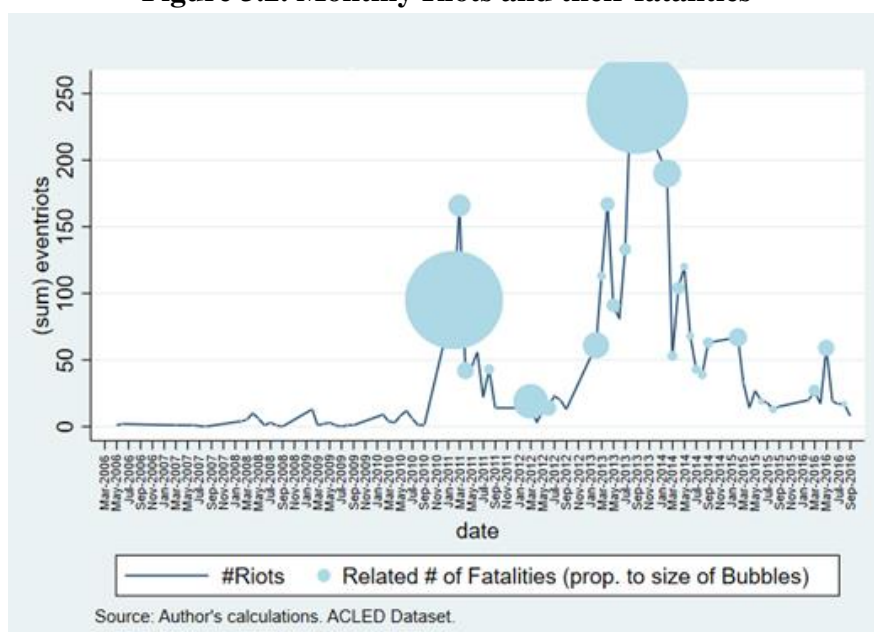
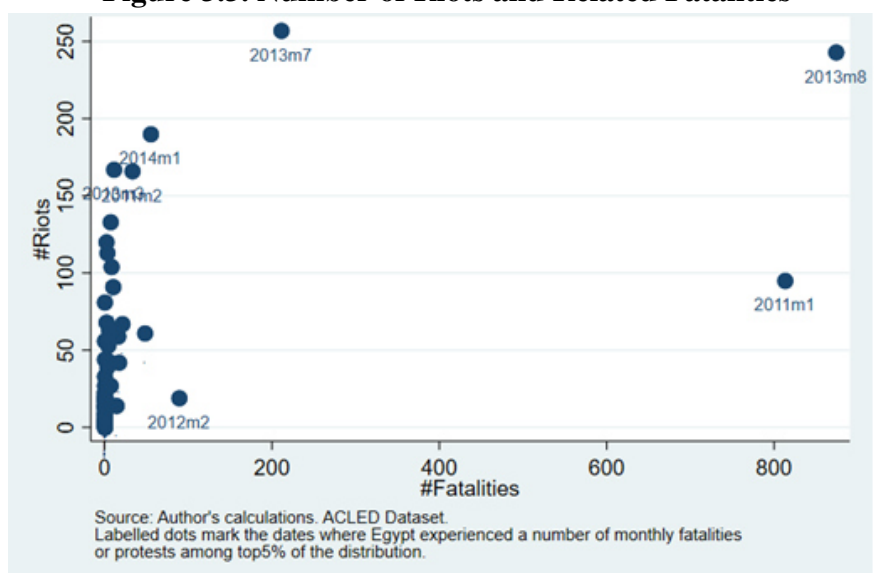
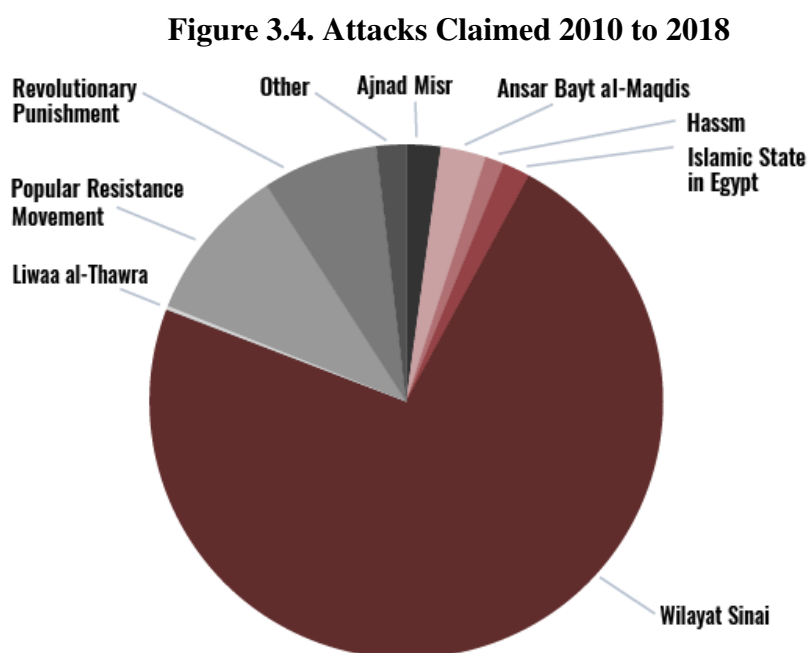


Figure 3.3. Number of Riots and Related Fatalities



As it was mentioned before, as attacks and assassinations occurred with greater regularity after the summer of 2013, so too did counter-terror operations across the country, especially in North

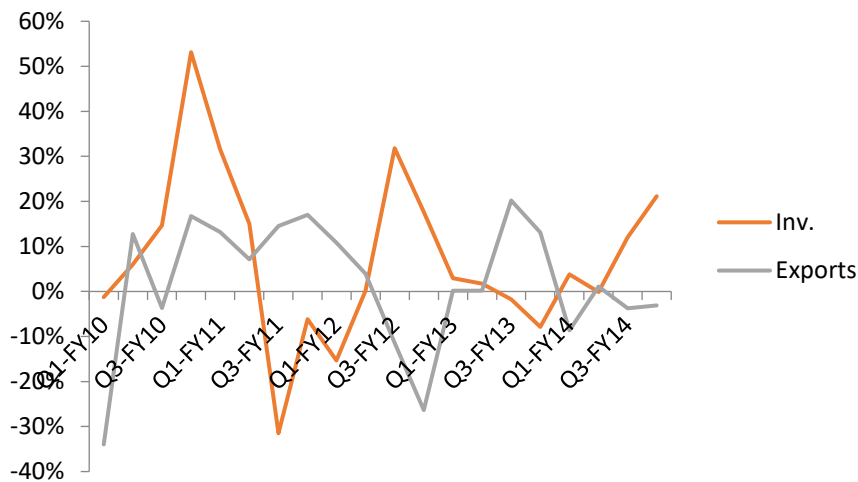
of Sinai. Moreover, while 50% of the attacks (around 1,343) have had claims of responsibility by established groups such as Ansar Bayt al-Maqdis (ABM) in North Sinai, Popular Resistance Movement and Revolutionary Punishment; or Hassm and Liwaa al-Thawra, the others took place in Wilayat Sinai as it is shown in Figure 3.4.



Source: TIMEP, 2018.

All these events and the political instability implied by them exerted a negative effect on production, investments and exports. Indeed, starting the quarter of the revolution (January-March 2011 – Q3FY11), the main macroeconomic aggregates affected by these developments were investment and exports. They declined significantly leading to a very low level of growth rates with a significant decrease in exports in April-June 2012 and July-September 2013 (see Figure 3.5) with the surge of riots and other events.

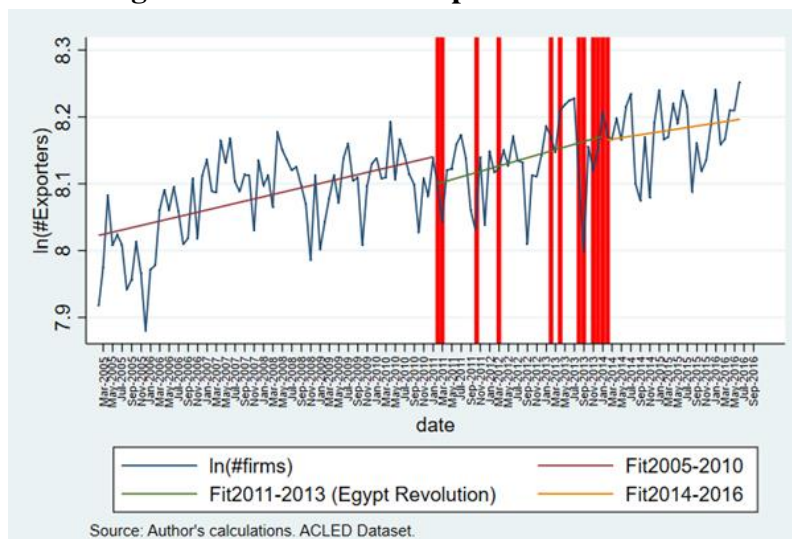
Figure 3.5. Growth Rates Exports and Investment



Source: Constructed by the author using the Central Bank of Egypt datasets.

This negative effect at the macroeconomic level was reflected also at the firm level. In fact, Figure 3.6 shows that while the number of exporters has been volatile over the whole period, two structural breaks can be observed in 2011 and in 2014 leading to a shift downward of the linear tendency of exporters. This shows to what extent the extensive margin of exports has been negatively impacted by political instability, in particular during periods where riots and events were remarkably intense (shown by the red lines).

Figure 3.6. Number of Exporters and Events

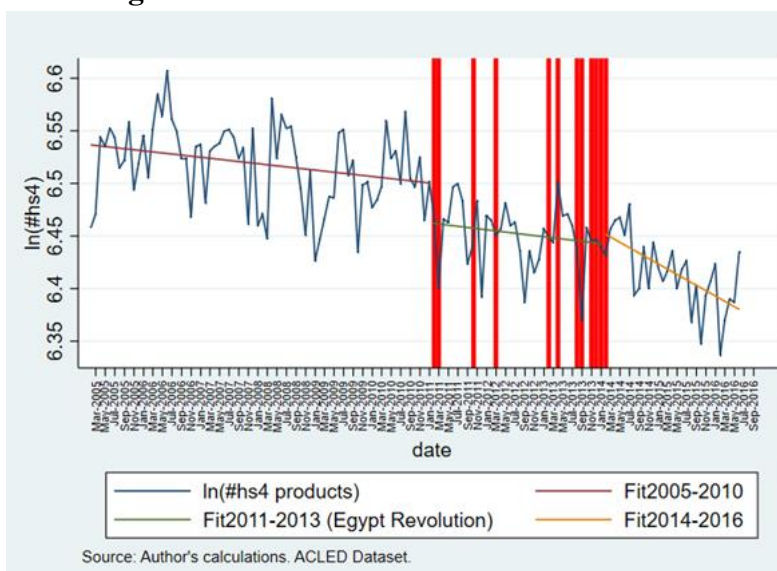


Source: Author's calculations. ACLED Dataset.

At the product level, the declining linear trend is even more pronounced since, over the period 2005-2016, a rationalization of the number of HS4 products has been observed with a significant shift downwards starting 2011 and with a steeper declining slope starting 2014. The

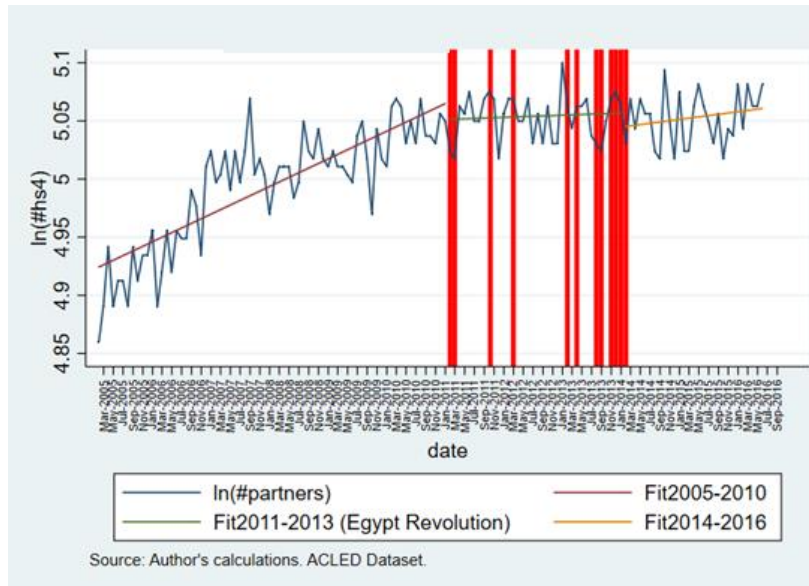
latter figure might have to do with factors that are external to Egypt (probably linked to the reduction of world demand and the slowdown of Asia's growth). In any case, this is consistent with the idea that, during difficult times, firms tend to focus on less products or the ones they master most as it is shown in Figure 3.7. Meanwhile, severe troughs can be observed for periods with more riots and events as it is shown by the red line.

Figure 3.7. Number of Products and Events



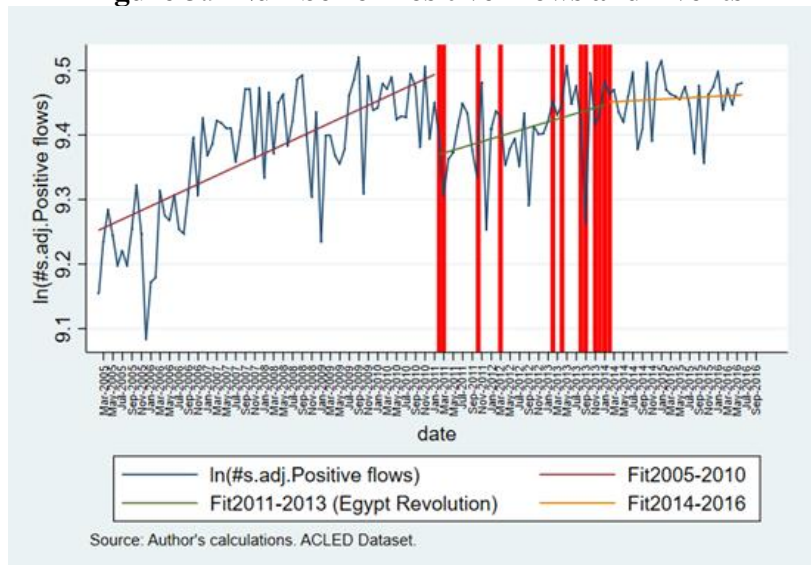
At the trade partners level, the rationalization effect was not observed. In fact, especially between 2005 and 2010, Egypt tended to diversify its markets by concluding different regional trade agreements and removing several non-tariff measures that affected both exports and imports. After the revolution of 2011 onward, the number of partners remained relatively stable despite a slight decline since 2014 (see Figure 3.8). Indeed, flows are reallocated across countries due to the degree of competition and competitiveness of exporters. Indeed, Egyptian exporters will avoid destination with a tougher competition since their competitiveness is partially eroded by political instability. The dynamics behind will be shown later in proposition 2 of the theoretical framework.

Figure 3.8. Number of Partners and Events



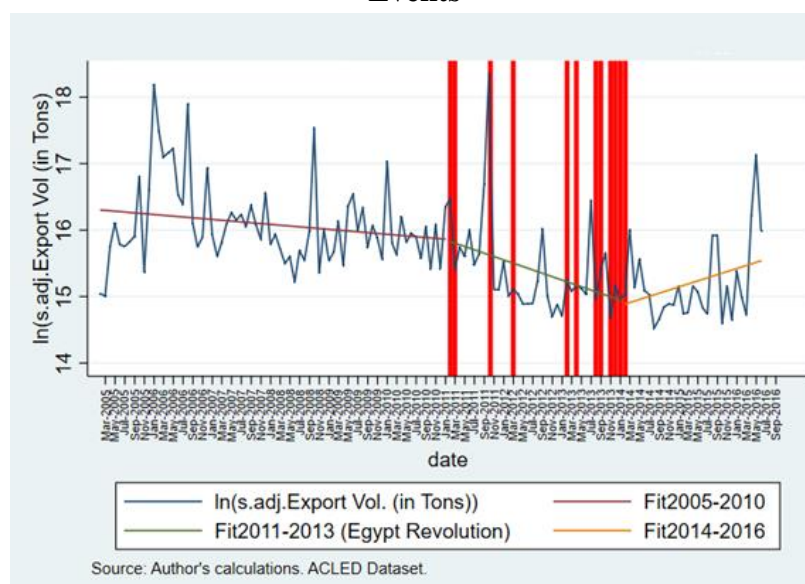
In the same vein, during the period of trade reforms (2005-2008), the total number of monthly business relationships between the Egyptian firms and the rest of the world (positive flows from GOEIC data) experienced a significant increase in tendency until 2010. Then, these flows decreased intensely with the revolution of 2011 (as highlighted by the green fitted line) and started to increase modestly to stabilize from 2014 to 2016. Hence, political instability might have led to a decrease in positive flows because of a higher uncertainty and higher transaction costs.

Figure 3.9 Number of Positive Flows and Events



When we analyze the evolution of total export volumes⁷ (Figure 3.10) and values (Figure 3.11) at monthly dates, three main remarks are worth to be mentioned. First, during the pre-revolution period (2005-2010), while volumes of exports remained relatively stable in tendency, values of exports were dramatically increasing *a priori* due to increase in prices of Egyptian exporters, themselves being influenced by macroeconomic inflation in Egypt and world markets at that time.

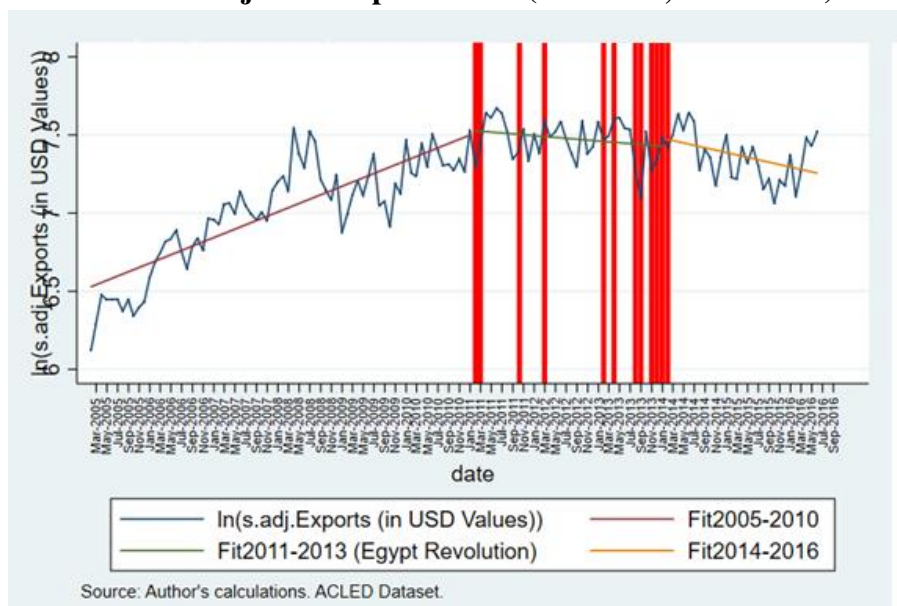
Figure 3.10. (Season and Specific Product- Adjusted) Export Volumes (in Tons) and Events



Yet, when political instability emerged in 2011, the downward trend of the volume of exports was strongly coupled with a decline in the values of exports but not at the same rate. At the firm level, this seems to indicate that export prices might not have been decreasing but rather increasing during the turmoil probably due to an induced increase in the costs of production or cost shipment. This might be also the result of a self-selection effect where a significant proportion of low-quality firms (low price firms) might have exited the market. In the last period, 2014-2016, these trends were rather reversed however, since exports volumes increased trivially coupled by a slight decrease in values of exports.

⁷ Total monthly volumes shown here are seasonally-adjusted (i.e. monthly-adjusted) and specific-product-adjusted (adjusted to the nature of products). This is realized through a prior regression where each exported flow in volumes at the firm, month and hs4 product levels, is regressed on monthly and product fixed effects. The firm residuals of the volumes are then aggregated up to the monthly total. Of course, this is an imperfect measure of total volumes of exports, but we think that monthly changes in this total could give an idea about changes in the true volumes of Egyptian exports.

Figure 3.11. Season-Adjusted Export Flows (in Values, Truncated) and Events



In a nutshell, with the surge of riots and other events in Egypt, while exporters kept their relatively geographically diversified structure of their markets, they rationalized the products they export and exported less quantities. Moreover, the number of exporters happened also to be in decline.

3. Theoretical Framework

In order to have a better idea of how the events experienced by the Egyptian economy during the 2011-2014 turmoil, might have been affecting the exports of the firms, we propose a simple set-up, based on the gravity and firm-heterogeneity literature.

The revolts on one hand, and the terror related events on the other, might have been decreasing productivity of producers and transporters (alternatively increasing the hourly costs of production and transportation), especially in the locations where the conflictual environments were the most frequent and intense. The possible increase in the costs of production of a firm facing those events, might come from two sources : the events might have disorganized firms' activity by probably increasing the movements of stop and go during the production process and increasing absence of working times of factors of production (employees might not show up to work at due times, working time of machines might also be altered). Thus, firms might face capacity constraints due to the events, all the more so when they are small. Big firms should be hit by the events too but they are expected to be more resilient. They can reorganize themselves by shifting labour and capital across units of production and/or tasks helping them adjust better to the shock.

Besides, the events might slow down if not impeded transportation of goods in some areas, due to insecurity in some areas maintained independently either by rioters or by terror groups. In turn, transportation networks could be further affected by the setting of security measures by the authorities (checkpoints, and banning access to some roads and ports). Also, producers might not receive on time raw materials or other intermediary inputs that they needed in order to enable the production of their goods. All in all, outputs produced and ready to serve the domestic and foreign markets might be limited either by production limitations or transport constraints. These additional costs of production and transport are expected to negatively affect exporters, but by how much?

Besides these induced costs, uncertainty might curb exports. Uncertainty arises from both demand and the supply sides. On the supply side, Egyptian producers might be less willing to invest in the short term which should be reducing exports in the mid term. As we study more what happens in the short run this effect is beyond the scope of our work, however. We are more interested however in this chapter in the rise of uncertainty from demand side. Because

of an uncertainty climate, buyers (here foreign importers) might be less willing to import from Egyptian export suppliers. This is again all the more likely that suppliers are small, irrespective of the destination served. But, conditioning out for the size of the producers, exports to some destinations for some typical exporter might be more resilient than for others because of long standing networks and solidarity purposes. For instance, one would expect exports to Arab and Mediterranean countries to be more resilient than export to faraway countries.

To treat these issues we begin by setting a simple set-up which aim is to emphasize the impact of the events on firm level exports. To make things simple and close to the standard theory, let us assume a distribution of N_i heterogeneous firms in country i , where each firm f produce only one variety (also referred to as f) of a differentiated product, in a monopolistic competition set-up. The heterogeneity of firms is expressed here in terms of their respective abilities being discovered when each firm enters the market and after having paid a fixed cost, F .

Furthermore, in addition to a level of an *ex-ante* ability, expressed by a_{ft} that a given firm f discovers when it begins producing, we assume that it cannot control an additional parameter linked to the business environment in which it produces. A particular event or set of events around a time t , expressed by a variable e_t in what follows, might then disturb the business environment, changing consequently the ex-post cost of production of the firm. Thus we denote the costs of the firm by $c_{ft} = c(a_{ft}, e_t)$. Besides, the events can also affect within (and at) the-border transportation costs, that we can represent by $\tau_{ft} = \tau_f(e_t)$.

In a monopolistic setting, profit maximizing firms charge a price to the final consumer in destination d (i.e. p_{dft}), that is directly proportionnal to unit costs involved to reach d , inflated by a mark-up μ_{ft} . These unit costs include costs of production, within-border transportation and beyond-the-border transport costs to final destination d , the latter being expressed by τ_{djt} . For f located in an exporting country, say o , its delivered price can be then expressed by the following:

$$p_{odft}(a_{oft}, e_{ot}) = \mu_{oft} c(c_{oft}, \tau_{oft}, \tau_{odjt}) = \mu_{oft} c[a_{oft}, e_{ot}, \tau_{odjt}] \quad (1)$$

On the consumer side, let us assume a particular situation where consumers in the observed country of destination d are uncertain to get delivered the varieties of products they would like

to purchase from a subset of countries, where they observe a fragile economic environment linked to political instability or conflicts escalation. These consumers have traditional quasi-concave Constant of Elasticity of Substitution (CES) preferences (consistent with risk-aversion in an uncertain environment) but where each subutility linked to a variety from some particular country is associated with a certain probability to get delivered the amount of varieties purchased. To make things tractable for the econometric part, and without loss of generality, we consider that each time consumers obtain information about a conflictual situation in one country they associate to the merchandize originating from the later some probability θ_t strictly inferior to 1. This probability corresponds to the beliefs of the consumers of that country d about the likelihood they will get delivered the product. These beliefs are linked to a public and a private source information. Public source information comes from the information delivered by the media about the intensity of the conflicts in the country of origin at date t (summarized by e_t), while the private source deliver supplementary private information to buyers in d (summarized by I_{dt}). Thus $\theta_{dt} = \theta(e_t, I_{dt})$ and tends the more to 0 the more intense the events happen to be, for a given level of private information. The consumers thus divide the countries of origin of their purchased products into 2 families: one group of secure countries S where products purchased from will be delivered with certainty and another group of countries O from which the purchased products might not be delivered eventually. The CES function can be thus expressed in the following manner:

$$U_{dt} = (\sum_s \sum_{f_s} x_{sft}^{\frac{\sigma-1}{\sigma}} + \sum_o \sum_{f_o} \theta_{odt} x_{oft}^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}$$

By updating discretely their beliefs about the parameter θ_{odt} at each time period with respect to the events e_{ot} which take place in O countries and the private information I_{dt} they have, the consumers from d maximize the above utility function with respect to their budget constraint. From first order conditions, the obtained optimal value of demand for a certain variety delivered by a firm f from an unsafe country o to destination d is then:

$$x_{odft} = \left(\frac{p_{odft}}{\Phi_{dt}} \right)^{1-\sigma} \cdot E_{dt} \cdot \theta_{odt}^{\sigma} \quad (2)$$

x_{odft} represents the amount of exports from o to d by firm f at time t . The variable E_{dt} represents total expenditure of consumers from d on the product being observed. Φ_{dt} is an

index of prices that apply in country d . It is expressed by $\Phi_{dt} = (\sum_o \sum_f \theta_{odt}^\sigma p_{odft}^{1-\sigma} + \sum_s \sum_f p_{sdf t}^{1-\sigma})^{\frac{1}{1-\sigma}}$.

Then, one can emphasize further the role played by the events in Egypt on the performance of its exporters. Applying equation 2 to these exporters one obtains:

$$x_{dft}^{Egy} = \left(\frac{p_{dft}^{Egy}(a_{ft}, e_t, \tau_{djt})}{\Phi_{dt}} \right)^{1-\sigma} E_{dt} \cdot \theta(e_t, I_{dt}^{Egy}) \quad (3)$$

Equation 3 constitutes the basis of our econometric work. It has important features that allow to link the impact of the events in Egypt to the performance of its exporters into each destination. The first remark is that the events can affect supply via the supply capabilities of the firm or within border transportation. But those same events might have an effect on demand via a change in the perceived risk by consumers abroad. Second, what should matter for the performance of the Egyptian firms on any destination market is relative prices $\frac{p_{dft}^{Egy}}{\Phi_{dt}}$, more than absolute prices *per se*. The price index Φ_{dt} which represents the average price in market d , depends upon all costs of production and transportation of all selling firms to d . In a destination market where the number of sellers is very high (high competition), the price index would be little affected by what happens in Egypt. However, in another destination where competition is relatively low, and the share of Egyptian exporters rather significant, the price index might be much more affected.

From equation 3, one can emphasize different predictions to be tested:

Prediction 1: The Egyptian events have a negative impact on the Egyptian firms in general (first order effect)

A shock of events in Egypt reduces exports, either through higher costs of production, higher costs of transportation (and internal security measures) or through a decrease in the likelihood of receiving the merchandise on due time by the consumers of destination d . This is all the more true for firms which are mostly exposed to the events (i.e located near the events)

Prediction 2: The Egyptian events could reallocate flows across countries

The reallocation of flows across countries is due to two possible factors. The first is related to the degree of competition in each destination: in destination markets where competition faced by Egyptians is sufficiently high (due to higher competitors producing similar products) , an increase in Egyptian costs due to the events will affect more the performance of Egyptian firms in those destinations compared to other destinations where competition faced by Egyptians is lower.

The second is related to the beliefs of the buyers in a destination about the degree of insecurity related to the shipment of the merchandize from Egypt. If in some countries the negative effect of the events are expected to be compensated by some private sets of information suggesting that the shipment of merchandize is being secured, exports from Egypt would be then less affected than one could expect.

Prediction 3: The Egyptian events should affect more smaller firms than bigger ones (reallocative effect across firms)

As already discussed in the introduction of this section, the additionnal fixed and variable costs induced by the events are likely to be better beared by the biggest exporters. Also, on the demand side, the importers might well be more confident about the receiving of their goods when they treat with big exporters than when they treat with smaller ones. This should be the case in each of the destination markets considered. Further, through the relative price term, when hit by the same shock, big exporters might find themselves relatively more advantaged than small ones through a reduction *in their relative costs* compared to the latter competitors. In fact, as their costs tend to increase less than small exporters their relative prices compared to the small actors go down. Although faced by the same shock on costs, this then tends to make big Egyptian exporters export more during the events. Another way to identify the reallocative effect is to look at a possible differential impact in prices across the sizes of the firms. If small firms experience a higher price increase due to higher costs increase induced by the events, compared to bigger ones, this should be also consistent with a reallocative effect across firms.

4. Methodology and Data

4.1 Methodology

This section tries to test each of the three predictions above. In order to test for the **first prediction**, one needs to transform equation 3 in logs and consider a testable version consistent with it. To make things clearer, we have replaced the t subscript into a monthly date and a yearly suscripts m and y . We added further an additionnal product dimension, h . We then propose to test the following equation:

$$\ln(x_{dfm,h}^{Egy}) = a_{fy} + \beta \cdot (\mathbf{Events\ var})_{my,(h)} + \lambda_{dhy} + \lambda_m + u_{dfm,h} \quad (4)$$

where a_{fy} is a (year x firm) mixed effect which should capture the ability of the firm to exports at time y (here we use a yearly effect insetad of a monthly one to capture yearly ability of the firm). λ_{dhy} is a mixed effect of (destination*product* year), supposed to capture all factors related to the destination market at year y (including demand and the yearly tendancy of the price index). λ_m is a (monthly)-seasonal effect.

The events variable (**Events var**) can take two alternative forms:

1. The first form we consider is the simplest one where **Events var** is directly linked to the total number of events experienced in Egypt over time (month-year frequencies). By using this simple form, we assume that all firms are being equally exposed to the events that are taking place in Egypt, in whichever location. However, because in many dates, especially before 2011, there were no events to be reported, considering logs would have eliminated all the observations where there were no events. We propose an alternative that is now becoming quite known in the literature, based on the Inverse Hyperbolic Sine (IHS) function imagined by Burbidge, Magee and Robb (1988). A version of the inverse hyperbolic sine function of any variable x is simply computed as $\ln(x + (x^2 + 1)^{0.5})$. We thus apply this function to the total monthly number of events experienced by the Egyptian economy and label it as **IHS-N.Events** in the rest of our study.
2. Further, we consider an alternative variable that we shall call (expected)-Exposure to Events hereafter. This variable considers that firms are not equally exposed to events across

governorates. In some governorates, events were much more intense than in others and because sectors of activities are concentrated in few locations in Egypt (for instance, agriculture being more pronounced in governorates along the Nile while some manufacturing sectors being in or around big cities), we compute an exposure to events measure in the following manner:

$$\text{Exposure to events}_{m,y,s} = \sum_{g=1}^G w_{g,s} \cdot \text{Events}_{g,my}$$

Where $w_{g,s}$ expresses the weight of the region g in national production of sector s , and where the number of events variable is being computed at the level of the governorate at time (m,y) . Weights are computed from the 2008 Egypt's Enterprise survey dataset provided by the World Bank where Egyptian representative firms from all of the country are being surveyed. Information about the firms' belonging to a typical ISIC sector is also provided. To understand better the exposure to events variable, let us imagine that the firms from a typical sector s , are located in 3 different sites, following the survey. Say, 60% are in Cairo, 30% in Alexandria and the remaining 10% in Sharkia governorates. Besides, suppose that the number of events in Cairo, Alexandria and Sharkia in a typical date are respectively about 120, 25 and 5 provided by ACLED data, then the expected exposure to events by a firm producing a product h , that belongs to industry s would be equal to : $(0.6*120) + (0.30*25) + (0.10*5) = 80$. Notice in passing, that the expected exposure to the events by this firm is necessarily smaller than the one given by the total number of events experienced by the country at the same date (130 events). Hence, unless all the events in one typical date are experienced in one location and the whole industry is concentrated in that location, applying the simple formula of the total number of events would overestimates the exposure of each firm to these events, ending up underestimating the impact of the events on exports. This is why we prefer to work on the Exposure to Events variable. Again, we apply the IHS function and label the new variable as **IHS-Exposure to Events** in what follows.

In order to test **the second prediction** we need to interact the number of events with a dummy identifying countries with some particular characteristics. We propose here to define four groups of countries (Arab countries, Med countries, Europe/North America and RoW). By so doing we expect to obtain some differences in the effects with respect to each group of countries. For instance, because of close resources and similar preferences, one might think that the degree of substitution is rather high between Egyptian products and similar goods produced

and sold in the Arab gulf or around the Mediterranean. This makes consumers from these markets rather sensitive to an increase in prices proposed by Egyptian exporters.

On the other hand, one could think that because of the existence of high networks between these areas and Egypt, importers might give less weight to the public (media) information on these events and more weight to private information. As private information in the business environment is more biased towards maintaining businesses despite the intensity of events, and for some even a willingness to increase business for solidarity reasons, one can think that Egyptian exporters to these areas might be, through such a channel, less harmed by the events than exporters to other regions. Hence, the net effect going through these two channels ends up being ambiguous. The way to test this is by running:

$$\ln(x_{dfm,h}^{Egy}) = a_{fy} + \sum_G \beta_G \cdot \mathbf{Events vars}_{my,h} * G_{dh} + \lambda_{dhy} + \lambda_m + u_{dftmh} \quad (5)$$

where G_d is a dummy representing each of the group partners (4 groups) and β_G being the impact on firm level exports, that is specific to each of the groups.

The third prediction can be tested through another sets of interactions. We can first define 3 size classes (top third of firms with the highest total exports to world, bottom third of firms with lowest exports and the remainig firms were classified under Mid-size firms)⁸. Then we group each third into a dummy class variable and run a regression while interacting with the number of events variable.

$$\ln(x_{dfm,h}^{Egy}) = a_{fy} + \sum_Q \beta_Q \cdot \mathbf{Events vars}_{my,h} * Q_{dh} + \lambda_{dhy} + \lambda_m + u_{dftmh} \quad (6)$$

where Q represents each of the 3 group of firms⁹.

⁸ We have opted for a classification based on total exports data between 2005 and 2010, because we did not want the classes we define to be endogenous to the events.

⁹ Firms classification is done by using the HS4 code since we compare the size of companies that produce comparable goods. For the sake of robustness checks, we made other classifications based on values and we obtained very comparable results.

4.2 Data

We have access already to data on conflicts and tensions in Egypt provided by the ACLED dataset. This data source delivers information about the exact date of an event, the exact geo-localization coordinates and the number of fatalities and/or injuries due to the event.

On the trade side, we use the data provided by GOEIC at the monthly level. We already have access to yearly level data but we think that in order to identify clearly the effect of the events on trade flows, it is extremely important to coincide as much as possible the dates of the events with those of the date of registration of the flows being exported from Egypt. We have cross-checked the GOEIC data with the UN-Comtrade-CEPII data on trade, one of the most used to run gravity equations. After aggregating up the ECES data to destination-product and yearly levels, we could indeed find good correlation between both datasets, for quantities of exports expressed in Tons (or Ton equivalents) and for values of exports with correlations between both datasets around 0.90.

Nevertheless, for a high proportion of flows at the firm level in the GOEIC, we have noticed that many firm level quantities were declared with positive figures while the corresponding values were registered as 0s (in the Egyptian currency and even more so, in Dollars). To anticipate the questions by the readers about the consequence of this truncation, we have run systematically three series of regressions. One first regression is based on the whole sample, around 1,300 million of observations. Here, all positive quantities in the GOEIC dataset are considered and the econometric model tries to look at the impact of the events on quantities at the finest level of observation (firm-product-destination-year and month of the year levels). Second, we run a similar specification but to explain now values of exports (expressed in thousands of US\$) which, because of the truncation in values, is based on a smaller set of observations (around 300, 000 thousand). Lastly, we re-run the same regression on quantities but now based on exactly the same sample as that being used for export values. As one shall notice, some differences arise when comparing the results on quantities for the whole sample and those on quantities for the smaller sample. Nevertheless, in the last tables when we interact our events variables with the type of destinations on one hand and different classes of firms on the other the results based on quantities appear to be quite similar for the big and the small samples. In our opinion, the reader should weight more the results based on the whole sample in all the tables being shown. And in the last series of tables where interaction terms are being

introduced, the results based on both samples for quantities (and the corresponding small sample on values) could be considered to be equally reliable.

5. Empirical Findings

In tables 1, 2 and 3, we take **prediction 1** to the test. Table 1 presents the results of the most basic specification where we examine the effect of events on individual exports (measured by both the quantity and the value of exports). In this table, the variable based on the plain number of Events is considered (**IHS-N.Events**).

In all our specifications, we control for the nominal exchange rate (defined as the number of units of Egyptian pounds per dollar) to condition-out the effect of exchange rate developments on exports. We actually think that changes in the exchange rates might be themselves endogenous to political instability (and the events). That being said, most if not all of our results in magnitude and signs are robust to the exclusion or inclusion of exchange rates.

Two empirical remarks are worth to mention. First, we run our regressions with three sets of fixed effects. The first set includes a benchmark simple fixed effects (month, year, firm, product and destination) as it is shown in columns 1, 4 and 7 of Table 1. One can think that the firm effect captures the average productivity of the firm during the observed period, while the destination effect on exports controls for all gravity time invariant variables (distance, language, etc.). Columns 2, 5 and 8 combine both simple fixed effects (month and products) and interacted ones (firm x year and destination x year). Here, we control better for all variables that are specific to firms and destinations but that vary over time. One could think of firm changes in capability over time (firm productivity changes or quality of products changes of the firm). The destination x year fixed effect controls for all changes in transaction costs overtime across destinations faced by Egyptian firms (tariffs, transportation costs changes, but also macroeconomic changes in the destination country, etc.). The last set contains month fixed effects, along with (firm x year) and (destination x product x year) effects. We believe that the last set is the most in line with the recent gravity literature and controls for several unobservables, including yearly average prices of observed products and changes in specific demand for these products at destination. While some regressions are run using the first two sets, we stick to the third set of fixed effects in most of the empirical analysis from Table 3 onward (see below).

Second, as already mentioned, Columns 1 to 3 regarding quantities are based on the large sample, columns 4 to 6 regarding values are based on the smaller sample and columns 7 to 9 are based on the same small sample but now reporting against quantities.

As it is shown in Table 1, while exchange rate is negatively associated to both the value and the quantity of exports (an increase in exchange means depreciation), events are in general insignificant with different fixed effects and for both quantities and values¹⁰. Table A.1 in Appendix 1 decomposes events by distinguishing between riots vs. terror and other events, but both remain in general insignificant.

In Table 2, we reproduce exactly the same specifications than those of Table 1, while replacing the plain number of events' variable by the Expected Exposure to Events variable (**IHS-Exposure to Events**). Interestingly, when using the whole sample (columns 1 to 3), the effect turns out to be negative and statistically significant on individual quantities being exported. However, the estimates on this new events variable is still small (about 0.07 in the most constrained specification (3). Note however, that when turning to values of exports in the smaller sample (col. 4 to 6 in Table 2), the impact turns now to be positive and statistically significant. Lastly, col. 7 to 9 provide non-robust estimates (mostly statistically insignificant).

In Table 3, we introduce an interaction term to test for an additional effect of intense events (those most deadly months, where fatalities were ranked in top 10% of events). Columns 1 and 2, show the results for the plain number of events and exposure to events respectively.

While the estimates do not change compared to Tables 1 and 2, the interaction terms do not seem to appear with a statistically significant negative sign. Columns 3 and 4 produce the same types of specifications than 1 and 2 but by replacing the current event variables by the total events observed during the last three months. Only the Exposure to events appears to be negative and statistically significant with an estimate of around 0.01 but surprisingly the impact of exposures to intense events appear to be 0.003 smaller. It is only when we split the sample into events related to riots and the rest of the events that we observe an additional negative deviation effect from the mean estimate in column (6) with exposure to riots. Note, however,

¹⁰ The difference between columns 1-3 and 7-9 pertains to the number of observations included. While the former includes the full sample, the latter focuses on flows that have non zero values.

that exposure to other intense deadly events (terrorism or remote terror) do not appear with a negative sign. They turn out to be positive for reasons we still do not understand.

All in all, even if the exposure to events measure appears to produce most results in line with Prediction 1, in particular when the whole sample on quantities is considered, the obtained estimates appear to be rather small (around -0.07 to -0.12). However, as we shall see in the next tables, these results seem to be hiding a composition effect across firms and countries. Besides, we shall also see that the obtained positive and rather surprising estimate on values hides a composition effect too.

In Table 4, we take **prediction 2** to the test. We look at whether exports are being affected differently across groups of destinations. As already discussed we have constituted four rather homogenous groups: Western Economies (EU and US); the Arabian Gulf Economies; the Mediterranean Economies (North Africa, Turkey and Greece); the big Asian economies (China, Japan and India); and the rest of world sample. Syria, Iraq and Libya were taken out of the studied sample because of war that was going on in these countries during the same period. Table 4 presents the results. The first two columns are based on the whole sample (quantities). Column 1 reproduces the same constrained specification than in the prior tables, with a month, firm x year and destination x product x year fixed effects. Column 2 adds up an additionnal constraint, by adding a month x year fixed effect (instead of month fixed effect only). Actually one can undertake such a specification because the exposure to events variable at hand is varying not only with month and year but also across products (across industries to which the observed product belongs). Thus, in such specification we are asking what is the impact on exports of a firm which is presumably close to the events at a given date (month-year), compared to a firm observed the same date but that is not being as exposed (because it belongs to another industry). As one can see, the results do not differ between columns 1 and 2 here where the impact appears to be quite different across types of countries: while the negative effect on exports to the West and Asia appears to be high (around -0.20 for Western economies and -0.15 for Asia, it is still negative and statistically significant for Arab countries but rather small while positive and statistically significant for Med countries. This is consistent indeed with prediction 2 whereby countries where competition is high for Egyptian products and where events produce high uncertainties (rich countries and Big Asian countries probably) the negative impact on exports is significant.

Tables 5 and 6 present the results by accounting for differences in responses across size classes of firms (**Prediction 3**). We class firms into 3 size classes in terms of their total exports during the period 2005-2010. We then follow the performance of those three classes of firms overtime and sudy how their bilateral export respond to Egyptain events.

Table 5 shows that smaller firms bear the main cost of political instability in terms of quantities but also values as presented in columns 1 and 2. It is worthy to note that the effect on quantity is almost three times stronger than that on value, suggesting that small firms adjust by rising their cost of production (prices) and selling less. Medium firms suffer also from the events for both values and quantities but to a lesser extent when compared to small ones. On othe other hand, we obtain a positive interaction between large firms and events. This result may be chiefly due to a substitution effect. Indeed, when small and medium firms (that represent around 95% of the total number of firms in Egypt) reduce their exports because of political instability, they are substituted by larger ones who increase their exports. Our results remain the same when we introduce a three-month lag of the events (in columns 3 and 4), when we distinguish between riots and other events (in columns 5 and 6), although for terrorism events the impact appears to be the highest on big firms rather than small ones. We have also run exactly the same regressions, by group of countries sub-samples. We found the same effects: small firms are always being hurt more than medium ones, which in turn are being more affected than big firms¹¹.

It is important to note from most of the results in Table 5 also that the effect on quantities is always stronger than on values; which means that prices are likely to increase the more we have an unstable political environment. This is confirmed by Table 6 that examines the effect of events on unit-values. Interestingly, the interaction between events and small firms is always positive and statistically significant (whether we introduce events only, with a lag or when we distinguish between riots and other events). The rationale behind it is as follows: more political instability affects the production capabilities of small firms since roads can be blocked affecting the likelihood of workers to go to their work. Hence, supply will decrease leading to a significant increase in prices (for a specific variety if it is monopolized by a certain producer).

¹¹ Results available upon request.

Yet, large firms are not significantly affected by these developments since they can easily adapt to overcome the cost implied by such an instability.

To sum-up, our results show that political instability exerts a negative effect on exports, more on the quantity than the value of exports and more on small than large firms.

Table 1: Impact of the Nb. of Egyptian Events on Firm level Exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)
Inv. Hyperbolic Sine (IHS)-N.Events	-0.005 (0.007)	-0.002 (0.008)	-0.004 (0.011)	-0.002 (0.003)	-0.005 (0.004)	-0.006 (0.004)	-0.006 (0.009)	-0.004 (0.008)	-0.009 (0.011)
log of exch.rates	-0.368** (0.181)	-0.496*** (0.189)	-0.545 (0.307)	-0.746*** (0.105)	-0.798*** (0.127)	-0.831*** (0.259)	-0.488** (0.205)	-0.681*** (0.207)	-0.873** (0.395)
Observations	1279488	1266308	1215507	314147	308342	292164	314147	308342	292164
R ²	0.695	0.744	0.824	0.405	0.460	0.648	0.812	0.865	0.918
Month_FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year_FE	Yes			Yes			Yes		
Firm_FE	Yes			Yes			Yes		
Product_FE	Yes	Yes		Yes	Yes		Yes	Yes	
Destination_FE	Yes			Yes			Yes		
Firm x Year_FE		Yes	Yes		Yes	Yes		Yes	Yes
Dest x Year_FE		Yes			Yes			Yes	
Dest x Pdt x Year_FE			Yes			Yes			Yes
Cluster	Month-Yr	Month-Yr	Month-Yr	Month-Yr	Month-Yr	Month-Yr	Month-Yr	Month-Yr	Month-Yr

Columns 1 to 3 cover the whole sample (all reported quantities). Columns 4 to 9 cover the sample with reported positive values.

* p<0.1, ** p<0.05, *** p<0.01

Table 2: Impact of Expected Exposure to Events on Firm level Exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)
(IHS)-Events Exposure	-0.082**	-0.036*	-0.070***	0.058***	0.062***	0.050***	0.005	0.047***	0.030
	(0.035)	(0.019)	(0.004)	(0.015)	(0.008)	(0.000)	(0.041)	(0.011)	(0.097)
log of exch.rates	-0.378***	-0.500**	-0.551*	-0.753***	-0.810***	-0.846***	-0.504***	-0.693**	-0.895**
	(0.021)	(0.210)	(0.285)	(0.180)	(0.218)	(0.266)	(0.112)	(0.295)	(0.360)
Observations	1279488	1266308	1215507	314147	308342	292164	314147	308342	292164
R ²	0.695	0.744	0.824	0.405	0.460	0.648	0.812	0.865	0.918
Month_FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year_FE	Yes			Yes			Yes		
Firm_FE	Yes			Yes			Yes		
Product_FE	Yes	Yes		Yes	Yes		Yes	Yes	
Destination_FE	Yes			Yes			Yes		
Firm x Year_FE		Yes	Yes		Yes	Yes		Yes	Yes
Dest x Year_FE		Yes			Yes			Yes	
Dest x Pdt x Year_FE			Yes			Yes			Yes
Cluster	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt	Month-Yr-Pdt

Columns 1 to 3 cover the whole sample (all reported quantities). Columns 4 to 9 cover the sample with reported positive values.

* p<0.1, ** p<0.05, *** p<0.01

Table 3: Impact of Intense Events and 3 months Lagged events on Firm level Exports

	(1) Ln(Q)	(2) Ln(Q)	(3) Ln(Q)	(4) Ln(Q)	(5) Ln(Q)	(6) Ln(Q)
Inv. Hyperbolic Sine (IHS)-N.Events	-0.006 (0.011)					
IHS-N.Events x High Fatal.	0.004* (0.002)					
(IHS)-Events Exposure		-0.068*** (0.004)				
IHS-Events Exposure x High Fatal.		-0.007 (0.012)				
3months IHS-N.events			0.000 (0.005)			
3months IHS-N.Events x High Fatal.			0.002** (0.001)			
3months IHS-Events Exposure				-0.108*** (0.011)		
3months IHS-Events Exposure x High Fatal.				0.032*** (0.003)		
3months IHS-N.Riots					0.008 (0.007)	
3 months IHS-N.Riots x High Fatal.					-0.005** (0.002)	
3months IHS-N.Other events					0.002 (0.005)	
3months IHS-N.Other events x High Fatal.					-0.002 (0.002)	
3months IHS-Riots Exposure						-0.076*** (0.020)
3 months IHS-Riots Exposure x High Fatal.						-0.055*** (0.011)
3months IHS-Exposure Other events						0.010 (0.009)
3months IHS-Expos. Oth. events x High Fatal.						0.132*** (0.005)
log of exch.rates(N.Eg.curr.units/\$)	-0.559 (0.316)	-0.738* (0.404)	-0.034 (0.148)	-0.554* (0.287)	-0.057 (0.294)	-0.546* (0.285)
Observations	1215507	824814	770921	1215323	770921	1215323
R ²	0.824	0.829	0.841	0.824	0.841	0.824
Month_FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm x Year_FE	Yes	Yes	Yes	Yes	Yes	Yes
Dest x Year_FE						
Dest x Pdt x Year_FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Month-Yr	Month-Yr-Pdt	Month-Yr	Month-Yr-Pdt	Mo-Yr	Month-Yr-Pdt

* p<0.1, ** p<0.05, *** p<0.01

Table 4: Heterogenous effects across destinations?

	(1) Ln(Q)	(2) Ln(Q)	(3) Ln(V)	(4) Ln(V)
IHS-Riots Exposure x Arab	-0.026*** (0.002)	-0.014*** (0.002)	0.124*** (0.030)	0.126*** (0.004)
IHS-Riots Exposure x West.	-0.225*** (0.013)	-0.215*** (0.003)	-0.007* (0.004)	-0.007*** (0.001)
IHS-Riots Exposure x Big Asia	-0.159*** (0.008)	-0.146*** (0.002)	0.299*** (0.007)	0.286*** (0.002)
IHS-Riots Exposure x Med.	0.038 (0.022)	0.054*** (0.002)	-0.010** (0.005)	-0.005*** (0.001)
IHS-Riots Exposure x RoW	-0.019 (0.011)	-0.009*** (0.000)	0.096*** (0.006)	0.098*** (0.001)
log of exch.rates(Eg.curr.units/\$)	-0.551* (0.285)		-0.846*** (0.266)	
Observations	1215507	1215507	292164	292164
R ²	0.824	0.824	0.648	0.649
MonthFE	Yes		Yes	
Month x Year_FE		Yes		Yes
Firm x Year_FE	Yes	Yes	Yes	Yes
Destination x Year_FE	Yes	Yes	Yes	Yes
Destination x Pdt x Year_FE				

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 5: Firm heterogeneity responses to Events

	(1) Ln(Q)	(2) Ln(V)	(3) Ln(Q),3m	(4) Ln(V),3m	(5) Ln(Q)	(6) Ln(V)
Small x Exposure to events	-0.574*** (0.083)	-0.150*** (0.032)				
Med x Exposure to events	-0.152*** (0.048)	-0.048* (0.026)				
Big x Exposure to events	0.247*** (0.044)	0.107*** (0.023)				
Small x Exposure to 3m events			-0.244*** (0.038)	-0.060*** (0.016)		
Med x Exposure to 3m events			-0.067** (0.023)	-0.019 (0.013)		
Big x Exposure to 3m events			0.122*** (0.022)	0.056*** (0.012)		
Small x eventriots					-0.626** (0.213)	-0.240 (0.139)
Med x eventriots					-0.113 (0.102)	-0.013 (0.070)
Big x eventriots					0.367*** (0.053)	0.089*** (0.025)
Small x eventterror					0.502 (1.014)	0.145 (0.585)
Mid x eventterror					0.552 (0.420)	0.296 (0.221)
Big x eventterror					-0.759*** (0.126)	-0.082 (0.056)
Small x eventremote					-0.701 (0.644)	0.126 (0.237)
Mid x eventremote					-0.749*** (0.198)	-0.434** (0.142)
Big x eventremote					0.290 (0.222)	0.254* (0.122)
Observations	696033	249058	695929	249017	696033	249058
R ²	0.839	0.652	0.839	0.652	0.839	0.652
MonthFE						
Month x Year_FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm x Year_FE	Yes	Yes	Yes	Yes	Yes	Yes
Destination x Year_FE						
Destination x Pdt x Year_FE	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 6: Firm heterogeneity, Events and Unit Values

	(1)	(2)	(3)	(4)	(5)
	Ln(UV)	Ln(UV),3m	Ln(UV)	Ln(UV)	Ln(UV)
SmallQ-Exp x (IHS)-N.Events	0.072*** (0.018)				
MidQ-Exp x(IHS)-N.Events	0.023*** (0.008)				
BigQ-Exp x (IHS)-N.Events	-0.011 (0.007)				
SmallQ-Exp x 3M(IHS)-N.events		0.050*** (0.015)			
MidQ-Exp x 3M(IHS)-N.events		0.007 (0.006)			
BigQ-Exp x 3M(IHS)-N.events		-0.026*** (0.006)			
SmallQ-Exp x (IHS)-N.Riots			0.047* (0.027)	0.062** (0.025)	
MidQ-Exp x (IHS)-N.Riots			0.012 (0.008)	0.018** (0.008)	
BigQ-Exp x (IHS)-N.Riots			0.001 (0.006)	0.002 (0.006)	
SmallQ-Exp x (IHS)-N.Other events			0.025 (0.036)		
MidQ-Exp x (IHS)-N.Other events			0.011 (0.009)		
BigQ-Exp x (IHS)-N.Other events			-0.021*** (0.007)		
SmallQ-Exp x 3M(IHS)-N.Riots					-0.021 (0.026)
MidQ-Exp x 3M(IHS)-N.Riots					0 (0.009)
BigQ-Exp x 3M (IHS)-N.Riots					0.009 (0.008)
SmallQ-Exp x 3M(IHS)-N.Other events					-0.027 (0.030)
MidQ-Exp x 3M (IHS)-N.Other events					-0.033*** (0.010)
BigQ-Exp x 3M (IHS)-N.Other events					0 (0.010)
SmallQ-Exp x (IHS)-N.Terror acts				0.063* (0.035)	
MidQ-Exp x (IHS)-N.Terror acts				0.005 (0.008)	
BigQ-Exp x (IHS)-N.Terror acts				-0.021*** (0.006)	
SmallQ-Exp x (IHS)-N.Remote events				-0.094*** (0.024)	
MidQ-Exp x (IHS)-N.Remote events				0.002 (0.007)	
BigQ-Exp x (IHS)-N.Remote events				0.003 (0.005)	
log of exch.rates(N.Eg.curr. Uni/\$)	1.047*** -0.232	0.700*** -0.245	0.956*** -0.227	0.916*** -0.226	-1.207*** -0.261

Obs.	289664	195278	289664	289664	195278
R-squared	0.945	0.959	0.945	0.945	0.673
MonthFE	Yes	Yes	Yes	Yes	Yes
FirmYearFE	Yes	Yes	Yes	Yes	Yes
DestinationPdtYearFE	Yes	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Errors are clustered by month, year and firm size

6. Conclusion

Using firm-level data merged with geo-localized data on terrorism events, this chapter has three main contributions. First, it examines the effect of political instability on the intensive and extensive margins of exports. We also compare the effect of the different events on firms (by differentiating between small, medium and large firms) and on quantity and values of exports (to disentangle the price and quantity effects). Second, to capture the short-term effects, as it was mentioned before, we rely on monthly data for both trade and events. Third, we merge two rich datasets. Regarding the firm-level trade data, one can take advantage of two dimensions in particular that are crucial for our identification: a product level information and the final destination of the good exported (or country of origin of the good imported).

Our main findings show that the intensive margin of trade is negatively affected by different events. This effect is more pronounced for small firms followed by medium ones for both the quantities and the values of exports, though stronger for quantities. Moreover, unit values experience an increase, notably for small and medium exporters. Egyptian exporters tend also to reallocate their exports from destination where they face a fiercer competition during period of political instability.

From a policy standpoint, given the large trade costs of war, it is indispensable to see how conflicts can affect trade in general and particularly exporters in Egypt. This point is fundamental as policymakers in Egypt, through the new strategy of the Ministry of Trade and Industry, are currently aiming at increasing and upgrading exports. This cannot happen unless political stability is guaranteed. Second, since small and medium firms bear the cost of political instability, it is important to guarantee a more stable environment if the government is seeking SMEs promotion.

Our research agenda includes several points. First, armed with the likelihood locality of production of some of these importantly traded products, and thanks to information about the final destination of the product, we are capable to re-trace the most likely route in Egypt these products have been taking, to reach the usual port of export to that destination. By doing so, we can then look at how the firms producing and exporting products (to which we could associate a place of production and a route), have been affected by the conflictual events in their locality and on the road to being shipped outside the country. Second, our results show the political

instability matters for the intensive margin of trade. To complete our analysis, we are planning to examine the effect of such an instability on the extensive margin of exports (probability of entry and of exit of firms). Indeed, any events might discourage exporters from entering the exports market and can lead some existing exporters to leave it if they are facing more uncertainty.

Table A.1: Decomposing events

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Val)	Ln(Exp.Q)	Ln(Exp.Q)	Ln(Exp.Q)
IHS-N.Riots	-0.006 (0.006)	-0.004 (0.006)	-0.004 (0.008)	0.000 (0.003)	-0.002 (0.003)	-0.003 (0.002)	-0.010** (0.005)	-0.006 (0.006)	-0.011 (0.007)
IHS-N. Other events	0.01 (0.006)	0.009 (0.006)	0.006 (0.006)	-0.002 (0.004)	-0.004 (0.004)	-0.002 (0.006)	0.039*** (0.010)	0.009 (0.007)	0.01 (0.010)
log of exch.rates(N.Eg.curr.units/\$)	-0.341* (0.177)	-0.464** (0.186)	-0.513 (0.293)	-0.803*** (0.096)	-0.842*** (0.112)	-0.866*** (0.244)	-0.777*** (0.090)	-0.628*** (0.191)	-0.761* (0.354)
Observations	1420188	1406121	1342130	363765	357362	336747	363765	357362	336747
R-squared	0.687	0.734	0.821	0.423	0.474	0.668	0.808	0.859	0.916
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes			Yes			Yes		
Firm FE	Yes			Yes			Yes		
Product FE	Yes	Yes		Yes	Yes		Yes	Yes	
Destination FE	Yes			Yes			Yes		
Firm x Year FE		Yes	Yes		Yes	Yes		Yes	Yes
Destination x Year FE		Yes			Yes			Yes	
Destination x Pdt x Year FE			Yes			Yes			Yes

Note: Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Errors are clustered by month and year

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Cherry MOUNIR SAAD KHALIL

L'impact de la transition politique et des perturbations économiques de l'Égypte sur sa performance des exportations : Trois essais

Résumé :

L'Égypte a été témoin de vagues d'événements qui ont affecté son instabilité politique et qui ont finalement entraîné des perturbations économiques. Fin 2010, les soulèvements ont commencé en Tunisie. Peu de temps après, particulièrement en janvier 2011, l'Égypte a pris la vague et des gens sont descendus dans la rue pour exprimer leur insatisfaction face à la situation économique et réclamer « Liberté, Dignité et justice sociale ! ». Ces événements ont entraîné des troubles politiques, suivis de perturbations économiques qui ont affecté différemment les classes sociales, les secteurs économiques et les régions géographiques. Dans une seconde vague, après plus de deux ans de perturbations et un climat d'incertitude politique et économique, une nouvelle vague de soulèvements a commencé à appeler à un changement de système, exprimant son mécontentement vis-à-vis des décisions gouvernementales, des services et de la qualité des infrastructures, notamment de l'alimentation électrique. Pendant cette période d'instabilité, des perturbations économiques ont eu lieu lorsque les investissements étrangers se sont éloignés de l'Égypte, les entreprises ont été affectées différemment et l'approvisionnement en électricité des ménages ainsi que des entreprises a été interrompu. En utilisant des données au niveau des entreprises, la thèse étudie l'impact de la transition politique et des perturbations économiques sur la performance des exportations de l'Égypte à travers trois angles : L'impact du type de propriété et de la conversion de propriété sur les résultats à l'exportation des entreprises, l'impact des coupures d'électricité sur les résultats à l'exportation des entreprises, et l'effet des événements par type sur les résultats à l'exportation des entreprises.

Mots clés : Exports, propriété, électricité, coupure, événements, Egypte

The Impact of Egypt's Political Transition and Economic Disruption on its Export Performance: Three Essays

Abstract:

Egypt has witnessed waves of events which affected its political instability and eventually resulted in economic disruption. In late 2010, uprisings started in Tunisia. Not long after, specifically in January 2011, Egypt caught the wave and people took to the street expressing dissatisfaction with the economic situation and calling for "Freedom, Dignity, and Social justice!". These events resulted in political unrest, followed by economic disruption which affected social classes, economic sectors and geographical regions, differently. In a second wave, after over two years of disruption and an environment of political and economic uncertainty, a new wave of uprisings began to call for a change of system, expressing dissatisfaction with government decisions, services and quality of infrastructure especially the power supply. During this period of instability, economic disruption took place where foreign investments shied away from Egypt, businesses were affected differently, and power supply to households as well as to companies was disrupted. Using firm level data, the thesis researches the impact of Egypt's political transition and economic disruption on its export performance through three angles: The impact of ownership type and ownership conversion on firms' export performance, the impact of electricity outages on firms' export performance, and the effect of events by type on firms' export performance.

Keywords: Exports, Ownership, Electricity, outage, events, Egypt



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